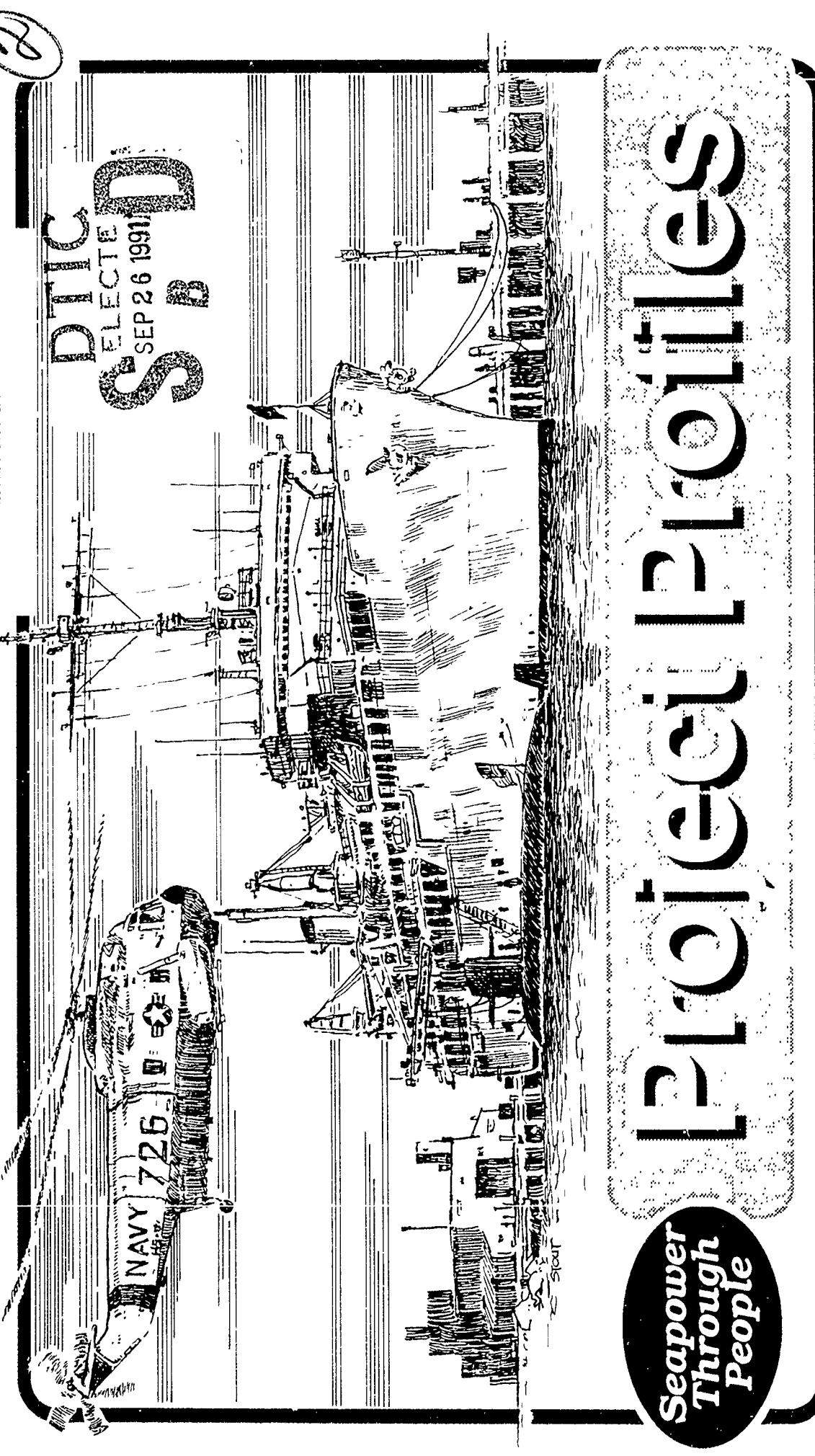
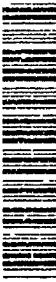




Navy Personnel Research and Development Center

San Diego, California 92152-6800 AP-91-16 July 1991

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T. F. FINLEY
Captain, U.S. Navy
Commanding Officer

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Foreword

Project Profiles contains information about the kinds of work currently being conducted at the Navy Personnel Research and Development Center (NPRDC).

In order to fulfill our mission, we are presently conducting over 100 in-house research and development projects. This publication contains brief descriptions of selected efforts. Projects on independent research/independent exploratory development (IR/IED) work are reported in the IR/IED Annual Report.

In addition to familiarizing the reader with the Center's work, it is our hope that these project descriptions will lead to an exchange of information between interested readers and project personnel. For additional information or further discussion of the Center's efforts, please contact us or any member of our staff.

NPRDC is interested in receiving employment applications from individuals specializing in a wide-range of disciplines. Experimental and cognitive psychology, personnel selection and training, management

science, operations research, economics, statistics, computer science, mathematics, and engineering psychology are professions represented at the Center. NPRDC is an equal opportunity employer.

We are looking for talented people who want to put their expertise to work solving challenging problems. If you are looking for a rewarding career and want to work in a creative environment, NPRDC may be the place for you. We would like to hear from you.

T. F. FINLEY
Captain, U.S. Navy
Commanding Officer

R. C. SORENSEN
Technical Director (Acting)

91-11605


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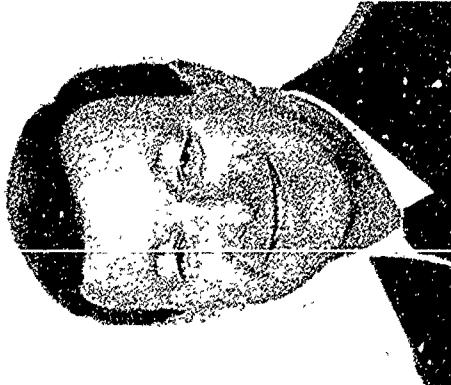
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About the Commanding Officer



Captain T. F. Finley
Commanding Officer

Captain T. F. Finley was born in Norwood, MA. He is a 1965 graduate of the University of Maryland, was commissioned as Ensign in June 1967, and received his Navy Pilot Wings in October 1968.

His first tour of duty was with Helicopter Antisubmarine Squadron SIX (HS-6) where he deployed to Vietnam aboard USS KEAR-SARGE (CVS 33), the Mediterranean aboard USS INDEPENDENCE (CVA 62), Canada aboard HMCS PROVIDER (AOR 508), and as co-pilot of the recovery helicopter for APOLLO 14 astronauts while aboard USS NEW ORLEANS (LPH 11).

After a tour as a flight instructor in HS-10, Captain Finley was Flight Deck Officer in the commissioning crew aboard the USS TARAWA (LHA 1). Ashore, he was the Helicopter Pilot Assignment Officer at the Bureau of Naval Personnel and later served as Assistant Detailer for Aviation Captains.

As Executive Officer then Commanding Officer of the HS-4 "Black Knights" he made an Indian Ocean deployment aboard the USS KITTY HAWK (CV 63) and an around-the-world cruise on USS CARL VINSON (CVN 70).

In Washington, DC, Captain Finley worked as Assistant Director of U.S. Senate Liaison in the Office of the Secretary of the Navy and later served as the Major Staff Placement Officer at the Naval Military Personnel Command. He reported aboard the USS OKINAWA (LPH 3) as Executive Officer in September 1986 and made cruises to the Far East and the Persian Gulf.

Captain Finley served for 2 years as Executive Assistant to the Commander Naval Air Force Pacific Fleet prior to reporting as Commanding Officer of the Navy Personnel Research and Development Center in January 1991.

His decorations include four awards of the Meritorious Service Medal as well as various unit, service, and campaign awards.

Captain Finley is the son of Mr. and Mrs. T. F. Finley, Sr. of Peaks Island, MN. He is married to the former Joyce Andrews of Chevy Chase, MD. They have two sons, Matthew and Gregory, and reside in Coronado, CA.

About the Technical Director



Dr. Richard C. Sorenson has served as the Acting Technical Director, Navy Personnel Research and Development Center (NPRDC) since February 1990.

He has been employed at the Center since its formation in 1973 and has planned, directed, and carried out research and development in personnel, training, human factors, neurosciences, and organizational systems. Since 1988, he has been the Associate Technical Director.

Before the Center was formed, Dr. Sorenson was on the staff of the Naval Personnel and Training Research Laboratory, the Army Research Institute, the University of Washington, and the American University.

**Dr. Richard C. Sorenson
Technical Director (Acting)**

M.S. and Ph.D. degrees from the University of Washington in 1962 and 1965 majoring in psychology. Later he studied mathematics, statistics, and economics at George Washington University. He is a licensed psychologist.

Dr. Sorenson was the recipient of the 1989 NPRDC Professional Publications Award and the 1990 Commander's Award for Management Excellence. He is a fellow of the American Association for the Advancement of Science. He is the author of over 40 professional contributions, including book chapters, journal articles, and papers presented at professional meetings.

Dr. Sorenson is married to the former Bertha Hartung. They have eleven children.

Dr. Sorenson received his B.S. degree from the University of Idaho in 1959 and his

About NPRDC

The Navy Personnel Research and Development Center (NPRDC) is the Navy's principal activity for the development of people-related technology.

Our field of endeavor includes five functional areas: manpower, personnel, testing systems, education and training, and organizational systems. These research areas address many complex and far-reaching questions that confront the Navy.

Project efforts vary greatly in focus, from system level to individual level and from immediate problems to problems that the Navy will face in 25 years.

Center products take diverse forms:

- computer models
- curriculum and training methods
- critical information, which is necessary for policy makers, administrators, and managers to work effectively.

The Center's professional staff, representing a variety of disciplines (statistics, mathematics, operations research, economics, computer science, personnel and organizational psychology, and instructional technology), are civilian scientists, civilian

technicians, and senior Navy personnel with extensive fleet experience.

The Center's research and development program is a comprehensive and effective system for developing the technology needed to

- improve personnel programs
- design more effective and less costly training programs
- optimize personnel management planning and compensation
- increase productivity
- improve morale
- reduce attrition

NPRDC is organized into six research departments: Manpower, Personnel, Testing Systems, Training Systems, Training Technology, and Organizational Systems (see Organizational Structure, p. 4).

NPRDC's reporting relationships within the Department of the Navy are shown on page 5.

History

NPRDC was established in May 1973. This action resulted from the consolidation of human resources research and development

(R&D) functions previously performed by the Naval Personnel Research and Development Laboratory, Washington, DC, Naval Personnel and Training Research Laboratory, San Diego, and the Personnel Research Division, Bureau of Naval Personnel. The Center was placed under the Bureau of Naval Personnel. Management control shifted to the Chief of Naval Material in May 1975, to the Chief of Naval Research in May 1985, to the Commander, Space and Naval Warfare Systems Command in February 1986, and to the Commander, Naval Military Personnel Command (NMPC) in May 1988. In May 1991, NMPC and most of the Deputy Chief of Naval Operations (Manpower, Personnel, and Training) combined to become the Bureau of Navy Personnel (BUPERS).

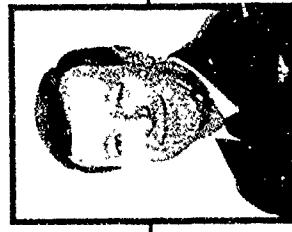
Mission

The Chief of Naval Operations has assigned NPRDC the following mission statement:

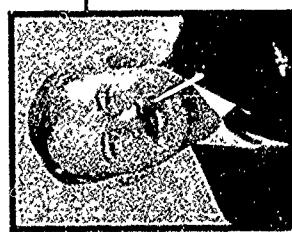
To be the principal Research and Development Center for the Department of the Navy's planning and utilization of manpower and personnel' and to pursue a coordinated technical development program in the areas of education and training.



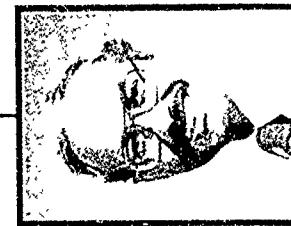
CAPT T. F. Finley
Commanding Officer
37812



CDR M. G. Brattland
Executive Officer
37814



Mr. M. Rowe
Manpower Systems
38034



Dr. J. Barack
Personnel Systems
37642



Mr. W. A. Sands
Testing Systems
39266



Mr. J. McLachlan
Training Systems
39305



Dr. R. C. Sorenson
Technical Director (Acting)
37813



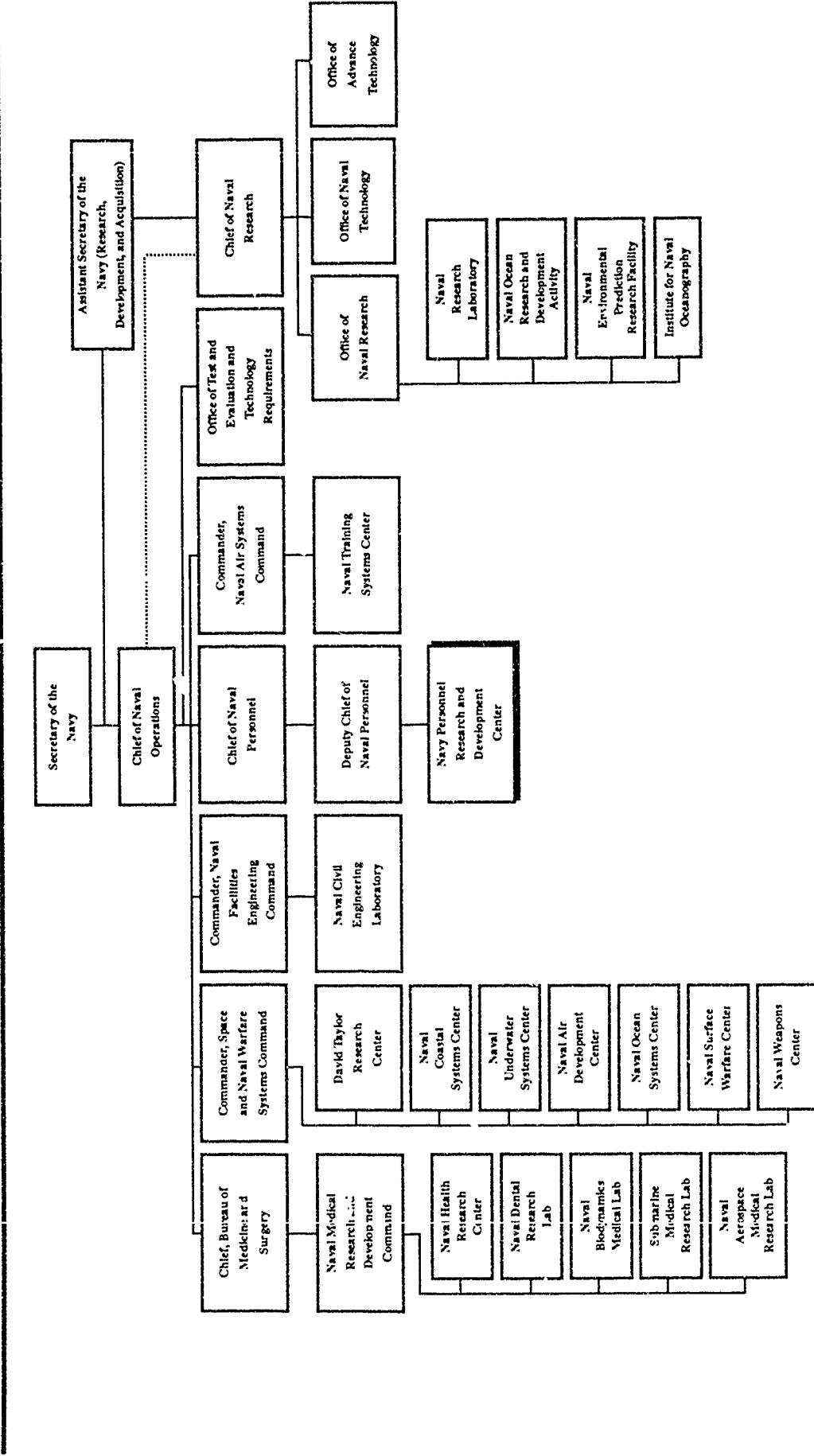
Dr. W. Waifeck
Training Technology
39269



Dr. D. Nebeker
Organizational Systems
37979

To reach NPRDC, dial Commercial (619) 55 plus the 5-digit extension indicated above.
If you are calling on Defense Switch Network (DSN), the prefix is 553.

NPRDC Organization.



Department of the Navy Research Development, Testing, and Evaluation (RDT&E)
Organization^a (NPRDC Reporting Relationships)

^aNot an official Department of the Navy organization chart

It is Center policy to perform only work that falls within the assigned mission, addresses high-priority Navy and Marine Corps requirements, and represents the most efficient use of available resources. We are determined to assist our sponsors, claimants, and customers in identifying and prioritizing requirements for manpower, personnel, and training (MPT) research and development.

Functions

In accordance with the mission statement, the Center performs the following assigned functions:

1. Plans and develops effective MPT products for Navy/Marine Corps operational application. Provides technical assistance to support the transition and implementation of Center products.
2. Develops and maintains in-house Navy/Marine Corps scientific and technical expertise to provide corporate knowledge, corporate memory, technological innovation, smart buyer assistance, and real-world understanding necessary for the development and support of Navy/Marine Corps MPT.
3. Plans and conducts an effective technology base program (basic research, exploratory development, and advanced technology demonstrations) to meet existing and projected operational requirements and to
4. Develops new systems and methods for determining manpower requirements, allocating manpower resources, developing personnel inventories, and distributing/ assigning those inventories to improve military readiness and control costs.
5. Develops systems and procedures for recruiting, selecting, classifying, and utilizing officer, enlisted, and civilian personnel to improve performance and retention. Serves as the Chief of Naval Operations' primary personnel survey resource to coordinate and conduct attitude surveys in the Navy and Marine Corps and to develop new survey technology.
6. Develops and evaluates personnel testing systems and computerized adaptive testing versions of the Armed Services Vocational Aptitude Battery. Serves as lead Department of Defense laboratory for overall management of computer adaptive testing (CAT) research, development, implementation, and scientific support of the system.
7. Develops training technologies to enhance personnel readiness.
8. Employs existing and emerging technologies in the development and application of training systems to alleviate
9. Develops and evaluate performance enhancement and control systems for improving the effectiveness, quality, and productivity of Navy personnel and organizations.
10. Develops, evaluates, and applies innovative personnel assessment technology.
11. Provides the Marine Corps with research and development support in MPT and organizational systems.
12. Provides independent analyses, technical advice, and consultation to research, development, test and evaluation (RDT&E) and operational managers in matters related to the Center's mission.
13. Investigates, defines, and addresses operational problems related to fleet personnel performance.
14. Maintains a field office in Washington, DC for the purpose of conducting on-site projects.
15. Develops, installs, and provides life cycle support for information management systems
16. Provides information and reports to higher authority and the scientific community

maintain scientific and technical leadership in MPT areas.

Navy training problems and improve the Navy's operational readiness.

on the progress and accomplishments of the Center's programs.

17. Provides technical support in the development of the BUPERS long-range plan with regard to the infusion of appropriate technology, definition and prioritization of RDT&E requirements, and the transition of products into operational use.

18. Provides information a.J technical support to the Center's BUPERS Program Manager in all matters related to the Center's operation.

19. Develops and maintains liaison with Navy, Department of Defense, and civilian RDT&E organizations for the exchange of information and the establishment of cooperative efforts in MPT areas.

related issues. This dual expertise permits the Center to develop the technology base for improving the use of human resources within Navy systems and to apply state-of-the-art technology to solve emerging problems. As a corporate asset, NPRDC is responsive to the needs of MPT managers in the Navy, Marine Corps, and Department of Defense (DoD), to the operating forces, and to the shore establishment that trains and supports the Fleet.

NPRDC is an applied research center, contributing to the personnel readiness of the Navy and Marine Corps. The Center develops better ways to attract qualified people to the naval services, to select the best, to assign them where they are most needed, to train each one effectively and efficiently, and to manage our personnel resources optimally. By combining a deep understanding of operational requirements with first-rate scientific and technical abilities, the Center is unique in being able to develop new, useful knowledge and to refine technology to address people-

Further interaction with operational commands involves a variety of valuable MPT databases that NPRDC has developed and maintained. Because NPRDC is an in-house corporate laboratory, these databases are readily available to support many different operational users and requirements. The databases, descriptions, and principal users are shown in Appendix B.

Funding

NPRDC operates under the RDT&E Resources Management System. Under this system, fiscal responsibility resides with the Commanding Officer and certain financial responsibilities are delegated to cost center managers. The reporting procedures associated with the Resources Management System provide financial information for internal management and higher authority.

The principal mission sponsor--and prime customer for Center RDT&E products--is the Chief of Naval Personnel. Significant sponsorship also comes from the Chief of Naval Research, the Marine Corps, and other Navy and DoD organizations, including the Systems Commands. The majority of RDT&E that the Center conducts is supported by direct Program 6 R&D funds, with 6.2, 6.3, and 6.4 efforts accounting for nearly all directly funded projects. A small portion of the funds are independent research (IR) and independent exploratory development (IED). In addition, a substantial portion of research, development,

Operating Philosophy

The R&D methods used by NPRDC are derived from behavioral, cognitive, computer, economic, and social sciences as well as applied mathematics and statistics. The application of these methods results in tangible products used by the Navy and Marine Corps.

NPRDC constantly searches for technological opportunities to improve personnel readiness and to reduce manpower costs. We are accountable to the Chief of Naval Personnel, our sponsors, and our users for high

productivity, strict ethics, honesty, integrity, professionalism, and perspective.

As part of its operating philosophy, NPRDC seeks to do as much of its work as possible in an operational setting where the final products of an effort are intended to be used. This helps to ensure that the needs and requirements of the users are met and that the users become familiar with the operational capabilities of the final products. Examples of NPRDCs on-site research applications are shown in Appendix A.

and analysis consists of reimbursables (specific problem-solving efforts requested by, and supported with funding from other organizations).

Personnel Staff Composition

Because R&D programs at NPrDC are mission-oriented, it is essential that the research force be multi-disciplinary so that early consideration may be given to alternative approaches in research endeavors. The Center's staff is creatively diverse and equipped to meet this prerequisite.

The staff numbers approximately 23 military and 269 civilian personnel. Of the civilians, a little under 200 are professional and technical personnel representing a variety of disciplines. Of the professional and technical staff, over 70 percent hold advanced degrees. The military staff consists of line officers and senior enlisted personnel. Military personnel offer extensive fleet and subject-matter expertise that helps ensure the operational relevance of NPrDCs R&D endeavors. This broad personnel base allows NPrDC to

maintain a highly effective, multi-disciplinary team approach to its R&D.

Facilities

NPrDC is located on Point Loma in San Diego, California, with a support office in Washington, DC. The Center occupies 17 buildings under a host-tenant arrangement with the Naval Ocean Systems C'ler. In addition to office space for research and support personnel, the following research facilities are housed at the Center:

The Training Research Computing Facility (TRCF) provides general computing services using various computer systems running the UNIX operating system. (Full support of Berkeley Standard Distribution (BSD), Sun operating system, and System V features.) The facility is supported by the Training Technology Department and provides software development, computational, electronic mail, and text processing support for research in areas of computer graphics, artificial intelligence, computer-assisted instruction, cognitive science, testing, and training. The TRCF supports the center-wide

Transmission Control Protocol (TCP)/Internet Protocol (IP) based local area network and provides NPrDCs access to the world-wide Internet (including the Military network and National Science Foundation network). The TRCF equipment suite includes two Sun SPARCserver 490's, three AT&T 3b2/1000's, two VAX-11/780's and numerous peripherals.

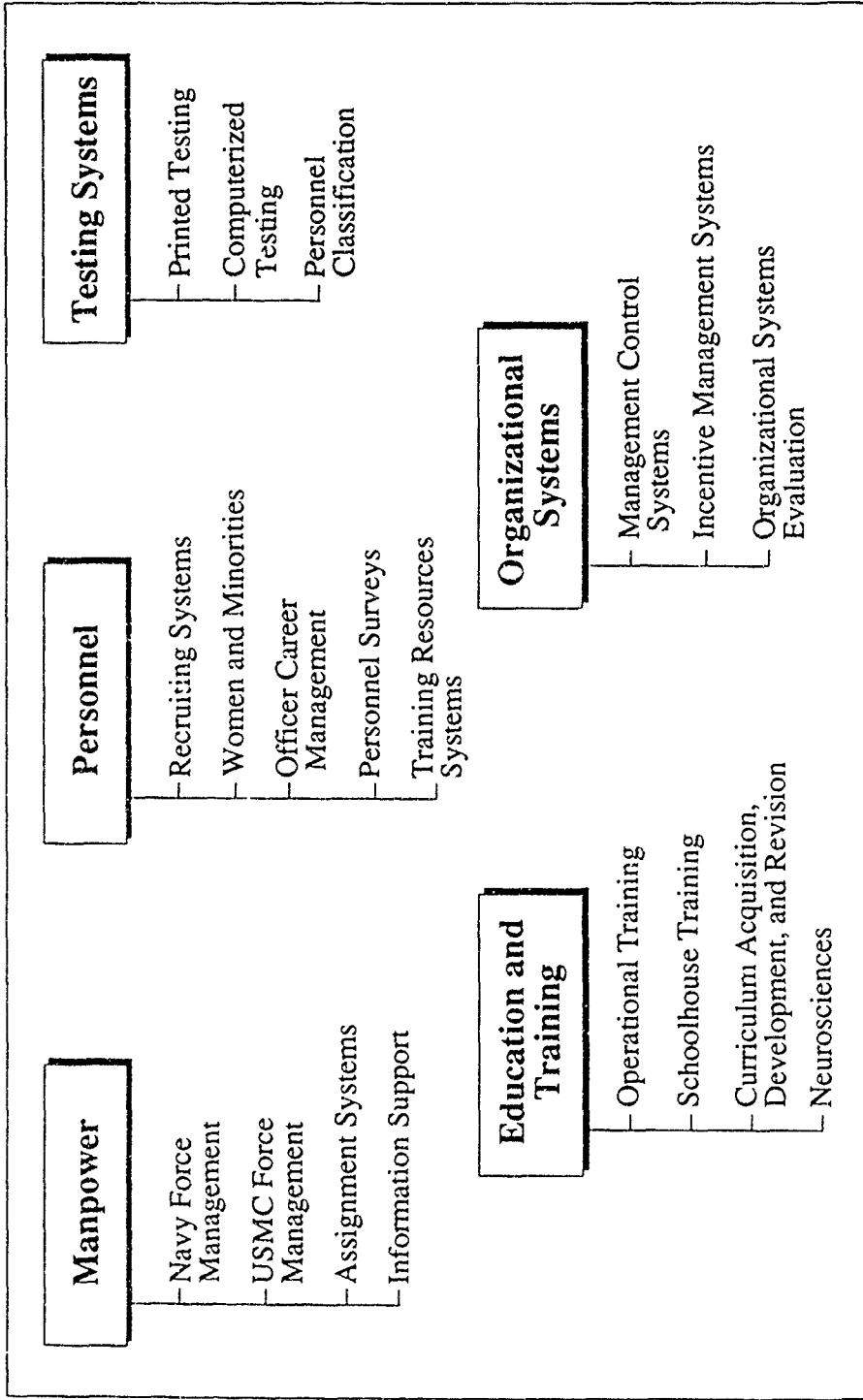
The Manpower and Personnel Computing Facility (MAPCOM) provides general purpose IBM-based computing services for Center research and administrative applications. The facility is specially equipped to serve psychologists, economists, mathematicians, and computer scientists whose research requires the organization and analysis of large data files, the development of large-scale mathematical models, the design of information delivery systems, and general-purpose scientific computing. The MAPCOM features an IBM 4381-91E, multiple tape drives, and over 50GB in disk storage.

The above facilities are supplemented by two mobile laboratories that provide R&D support at sites away from the Center and by a large inventory of computer equipment supporting specific projects.

NPRDC Functions and Product Lines

The research and development program at NPRDC addresses five functional areas:
Manpower, Personnel, Testing Systems,

Education and Training, and Organizational Systems. Within these five functional areas we have 16 product lines, each comprised of one or more projects. The remainder of this publication describes these functional areas, product lines, and selected projects.



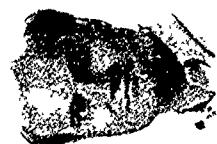
Manpower

Function and Product Line Descriptions

Develops new systems and methods for determining manpower requirements, allocating manpower resources, developing personnel inventories, and distributing/assigning those inventories to improve military readiness and control costs.

- **Navy Force Management** ↳ Designs and develops large-scale systems for managing the flow of personnel (accessions, retention, promotion) to attain desired skill inventories within the constraints of cost, allocating manpower resources, and developing and executing manpower appropriations.
- **USMC Force Management** ↳ Designs and develops systems to justify and effectively execute U.S. Marine Corps manpower plans.
- **Assignment Systems** ↳ Designs and develops systems for improving the assignment of officer and enlisted personnel to jobs (billets) based on cost constraints, fleet requirements, individual preferences, and a wide variety of assignment policies.
- **Information Support** ↳ Investigates and evaluates Information Resource Management (IRM) technologies for manpower, personnel, and training (MPT) applications by exploring new tools and techniques, developing prototype systems, and distributing promising technologies to functional application development efforts.

Joint Specialty Officer Management System (JSOMS)



*Douglas Hentschel
(619) 553-0535*

JSOMS product, an integrated Information Delivery System (IDS). The IDS enables a user to retrieve and display a variety of data pertaining to historical joint duty assignment information. This application was delivered to PERS-455.

Preliminary work on the simulation model has begun. The model will give the Navy the means to test JSO assignment policy alternatives. PERS-455 will be able to determine:

1. If current Navy policies ensure compliance with the provisions of the Goldwater-Nichols Act,
2. The effects on compliance of changes to current Navy policies,
3. The effects on compliance of any future changes to the Goldwater-Nichols Act.

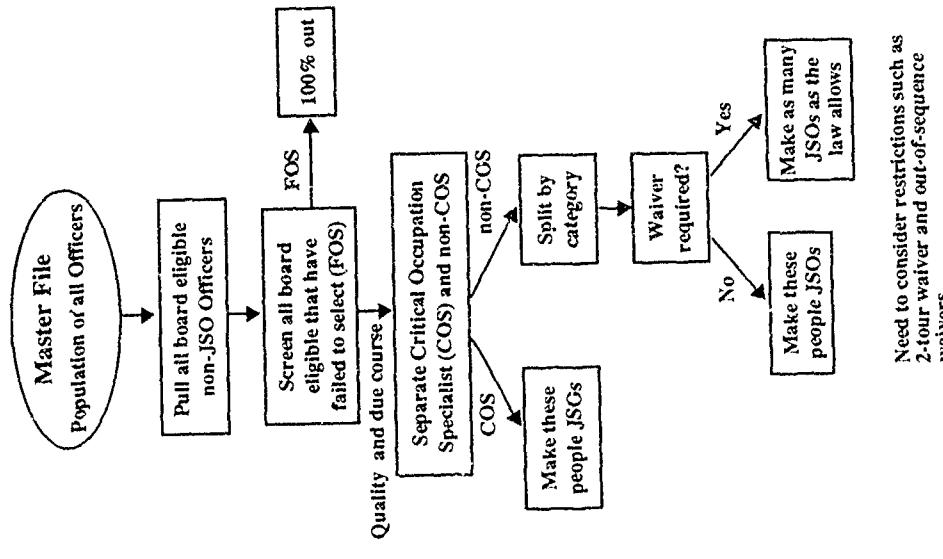
A major provision of the Goldwater-Nichols DoD Reorganization Act of 1986 requires the Secretary of Defense to train and manage officers with joint service expertise (i.e., experience in working with joint service staffs or in the Office of the Secretary of Defense). The Joint Specialty Officer Management System (JSOMS) provides the Navy with a decision support capability to direct its Joint Specialty Officer program (PERS-455). The Navy uses the JSOMS to track officers with joint duty experience, including those selected as Joint Specialty Officers (JSOs) following specific education and service in joint duty billets. The JSOMS will also implement a model that, through simulation, will evaluate the Navy's ability to comply with constantly changing requirements, rules, and policies.

JSOMS development began with a study of the data sources and information formats used by the JSCO program. These information requirements became the basis for the first

on PERS-455 by the Navy, the Secretary of Defense, and Congress.

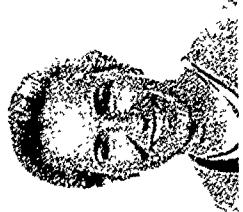
Program Element: 0603707N

Yearly Joint Specialty Officer (JSO) Board Selection Logic



Need to consider restrictions such as 2-tour waiver and out-of-sequence waivers.

Distributable Inventory Management Information System (DIMIS)



Susan Pinciari
(619) 553-8028

DIMIS supports the development of routine plans and ad hoc analysis of personnel policies. The DIMIS effort has three thrusts.

First, a model that forecasts future EMC inventories was developed. The SKIPPER model makes projections by length of service (LOS) and gender within each EMC. The spreadsheet-based model allows community managers to test the impact of alternative school plans and reenlistment bonus levels on future strength levels.

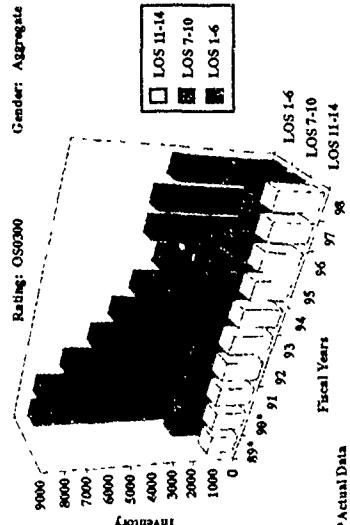
Several times each year, as part of the Navy's military personnel budget cycle, the Enlisted Plans and Community Management Branch of the Deputy Chief of Naval Operations (PERS-22) must develop enlisted accession, promotion, training, and strength plans. The planning tools available to PERS-22 have not forecasted personnel inventories at the levels of detail needed for the effective management of the enlisted personnel inventory. Specifically, no tools are available to forecast inventories and personnel flows (e.g., attrition, reenlistment) for homogeneous skill categories (Enlisted Management Communities or EMCs). This project is developing an integrated system of inventory forecasting models, databases, and information delivery software known as the Distributable Inventory Management Information System (DIMIS).

forecast community strength under different enlistment contract mixes).

The development of a system for retrieving and displaying aggregated historical and projected personnel inventory and flow data represents the third thrust. Initially, a requirements analysis will be done to assess the information needs of the various PERS-2 divisions. Based on this study, alternative database structures, storage techniques, access methods, and graphics packages will be considered in designing the Information Delivery System (IDS). Initially, a small-scale prototype will be developed and modified, as required, based on user feedback.

Program Element: 0603707N

A second, related thrust is developing models capable of assessing the impact of alternative policy scenarios (e.g., reenlistment policies) on the size and composition of the enlisted communities. For example, the ENCORE model was developed to determine the number of first term reenlistments that should be accepted in order to reach future community strength goals. Future plans include adapting the ENCORE model to conform with changes in Navy policy (e.g., possible expansion of reenlistment controls to second or third term reenlistments, changes in extension policy), tighter integration of ENCORE and SKIPPER (allowing users to use ENCORE-derived continuation rate behavior in school planning), and development of additional "what-if" type models to meet emerging requirements (e.g., models that can



*Actual Data

U.S. Marine Corps Enlisted Planning System (EPS)



*Carol Mullins
(619) 553-0538*

flows for 7 fiscal years by occupational field (OCCFIELD), paygrade (PG), and years of service (YOS). The personnel flows forecasted by the IPM include both end-of-active-service (EAS) and non-EAS losses, accessions, paygrade changes, and reenlistments. Total active duty (ALMAR) summary information is also produced. A prototype version of the IPM (without OCCFIELD) and an enhanced IPM were delivered to Headquarters, USMC (MPP-20).

The primary task of U.S. Marine Corps (USMC) enlisted manpower planners is to "grow" a personnel inventory with the appropriate skills, experience, and training, within a budget imposed by Congress. Developing this inventory requires the ability to: (1) produce accurate, reliable, and defensible manpower plans, (2) carefully monitor the execution of these plans, and (3) estimate the impact of policy changes on personnel strength behavior.

An integrated modeling system, the Enlisted Planning System (EPS), currently under development, addresses these needs. EPS contains an historical, aggregate personnel database; a set of forecasting, planning, and resource allocation models; and a "friendly" user interface.

The cornerstone of EPS is the Inventory Projection Model (IPM). The IPM produces forecasts of enlisted inventories and personnel

in the IPM. Finally, the EPS user interface allows users to access EPS. Through a series of queries and menu selections, the user can select a model, define a model scenario, run the model, and print model output.

Future efforts will concentrate on the development of the EPS supporting models. Each of these models deals with a specific planning function (e.g., Bonus Planning Model). These models receive information from and pass information to the IPM and operate at levels of detail in addition to OCCFIELD, PG, and YOS. EPS, which currently operates on an IBM mainframe computer, will migrate to a 486-based personal computer. Tests have shown no degradation in performance or accuracy in moving to the PC environment.

Program Elements: 0602131M and 0603/32M
Publications

Lee, Mei-You. (August 1990). Allocating promotions to year of service (YOS) cells in a Marine Corps inventory projection model (NPRDC-TN-90-26). San Diego: Navy Personnel Research and Development Center.
Boyle, J. P., & Mullins, C. (September 1989). Improving Marine Corps enlisted personnel loss forecasting (NPRDC-TN-89-35). San Diego: Navy Personnel Research and Development Center.

Officer Distribution Management System (ODMS)



*Mike Shoecraft
(619) 553-7922*

system is known as the Officer Distribution Management System (ODMS). The major functions of the ODMS include projecting personnel inventory available to rotate to other activities and forecasting vacant manpower spaces, allocating personnel inventory to the vacant manpower spaces, and monitoring the execution of the allocation plan. ODMS will allow the Navy to improve skill utilization and better balance officer personnel among Navy activities.

The Navy has a scarcity of officers in certain grades and skills (e.g., strategic planning, weapons, intelligence). Because of their importance, Fleet activities (such as ships and squadrons) are manned at 100 percent; therefore, personnel shortages exist at shore activities. Many of these shore activities need officers with special skills. The relative priority of each activity, fleet or shore, and the best use of officers' skills must be carefully considered when allocating these scarce resources among competing requirements. For example, key positions at the Joint Chiefs of Staff, at the Navy War College, and on afloat staffs all require strategic planning skills and must each compete for the same personnel. In the past, the officer allocation process lacked timely, accurate information to assess officer skill utilization or to assess the importance of allocating officer personnel among shore activities.

The objective of this effort is to design and develop a computerized decision support system to improve officer allocation. This

The Officer Management Information System (OMIS) subsystem was also completed and installed. OMIS provides a user-friendly front-end which changes in ODRPJ and NMP-O model parameters, executes the steps to develop an allocation plan, produces reports, and views model output. OMIS is designed for access through the Officer Assignment Information System (OAIS) with terminals located in the NMPC Officer Allocation Manager's spaces. OMIS also provides information to assist placement officers in execution of the allocation plan. The placement officers can view: (1) how manpower billets are filled by activity, (2) advancement of allocation goals by month, (3) grade substitutions, which must occur for optimal plan execution, and (4) vacancies due to skill shortages.

ODMS will be expanded to Restricted Line (RL), Limited Duty Officer (LDO) and Warrant Officer (WO) communities. The same projection and allocation capabilities discussed above will be developed for these officer communities and integrated into the existing systems to obtain a totally integrated ODMS.

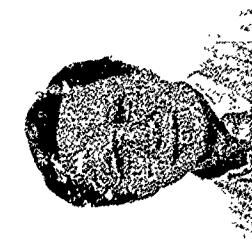
Future plans include expanding ODRPJ and NMP-O to Staff Corps communities and developing additional tools to assist the placement officers in execution of the allocation plan. These tools will track officers training for manpower spaces and monitor the assignment of officers to manpower spaces.

Program Element: 0603707N

The Officer Distribution Projection (ODPROJ) subsystem was completed and installed at the Navy Military Personnel Command (NMPC) for Unrestricted Line (URL) officers. ODPROJ projects next year's available inventory by simulating inventory movement (e.g., promotions, losses) over the projection timeframe (up to 2 years). At the end of the projection period, ODPROJ produces the projected onboard inventory (inventory available to rotate) and projected vacant manpower spaces.

The Navy Manning Plan for Officers (NMP-O) subsystem was completed and installed at NMPC for Unrestricted Line (URL) officers. NMPC policies are reflected through user inputs for CNO approved Manning (personnel/manpower spaces) goals by activity category (e.g., ships, afloat staffs, aviation training, Defense agencies), skill substitution, and grade substitution. NMP-O provides the NMPC Officer Allocation Manager with an allocation plan for all Naval activities and officer skills and grades.

Computer-enhanced Detailing and Distribution (CEDAD)



assignment process labor-intensive and costly. In addition, policies and rules are often not consistently interpreted, prioritized, or applied.

The objective of this effort is to design and develop a computerized decision support system to improve enlisted assignment. Improvements are expected to include faster personnel assignments, better utilization of skills, and greater satisfaction of individual location preferences.

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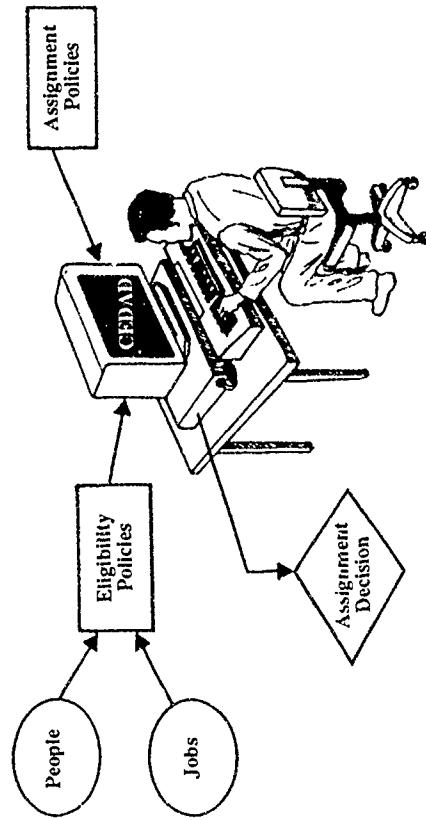
The Navy's enlisted personnel assignment function attempts to match the rotation of sailors with available jobs to achieve several important readiness objectives. The process requires a substantial organization and is quite complex. About 15,000 assignments are made each month by almost 300 assignment decision-makers or detailers. Detailers represent hundreds of skill areas and must make assignments while trying to obey changing rules and regulations (e.g., limitations on female assignments), personnel policies (e.g., satisfying individual preferences), and constraints (e.g., move budgets).

Detailers can retrieve descriptive data on members and jobs through a computerized information system. However, the actual matching of individuals to jobs is still largely manual. They must rely heavily on their own judgement in making decisions. The absence of decision support capability makes the

will then rank the jobs according to the priorities of personnel policies in effect. CEDADS interactive design will enable detailers to change eligibility and policy parameters and produce alternative sets of job nominations while making the final assignment decision.

The engineering/hull prototype will be completed soon. Details from the engineering/hull ratings will participate in test and evaluation of the prototype. Upon completion of testing, the engineering/hull system is expected to transfer to a production status. In the future, CEDAD will be expanded to other ratings.

Program Element: 0603707N



Sea/Shore Rotation Modeling (SSRM) System



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Naval Operations (PERS-22) use several PC-based tools to assist in formulating and evaluating personnel policies and plans. However, none of the existing models deal explicitly with sea/shore rotation policy and its interactions with other policies affecting training, compensation, sea/shore rotation, billet structure, and personnel gains and losses.



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To ensure that fleet and shore facilities are adequately staffed, the rotation of enlisted personnel between sea and shore commands must be carefully planned. Sea/shore rotation management objectives must include aligning personnel inventory with billet authorizations, while at the same time providing fair and equitable sea and shore tour lengths to meet the needs of the individual enlisted sailor. Because the balance of authorizations at sea and shore (billet structure) varies for specific skills, comparable tour lengths among skills are not possible. Currently, tour lengths are based primarily on sea/shore billet ratios. Yet, accurate, executable rotation policies require that accessions, training pipelines, promotions, compensation, and retention be considered simultaneously.

The Enlisted Community Managers (ECMs) in the Enlisted Plans and Community Management Branch of the Deputy Chief of

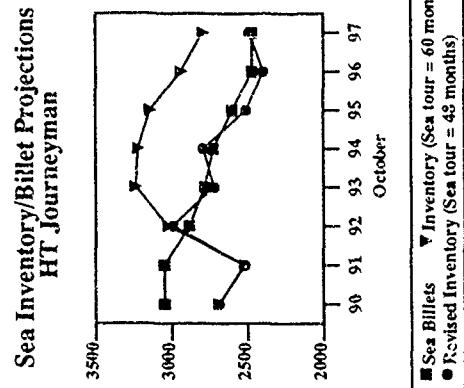
experimenting with changes to the model input data. After the model does the actual inventory projections for a selected enlisted rating community, a "back-end" subsystem supports the analysis of model results by generating graphical and tabular output.

A fully operational version of the SSRM system was installed for 32 ratings representing 9 ECMS. Various model and data requirements are scheduled. The remaining ECMS will receive their versions in the near future. SSRM will be used by the ECMS during this time period to evaluate alternative personnel policies to respond to planned personnel force reductions.

Program Element: 0604703N

The PC-based Sea/Shore Rotation Modeling (SSRM) system provides the ECMS with a new decision support capability. SSRM allows the ECMS to project the interactive effects of accession, training, compensation, advancement, and sea/shore rotation policies on sea and shore manning by paygrade. In addition, SSRM is the only tool that can assess the feasibility of achieving a given sea/shore billet structure.

SSRM is the result of a collaborative effort between NPRDC and the Center for Naval Analyses (CNA). The SSRM "model" was based on the Personnel Management Integration Tool (PERMIT), originally designed by CNA. NPRDC has made numerous changes to improve model realism and to make the input and output more useful to an ECM. NPRDC also developed SSRM as an integrated set of data manipulation, modeling, and output capabilities, called subsystems. The ECMS communicate with these subsystems via a user interface or "front-end." The front-end contains a series of nested menus and data entry screens to provide the ECMS with an easy-to-use, structured environment for



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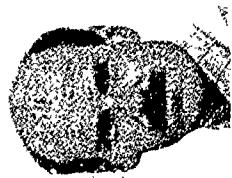
Personnel

Function and Product Line Descriptions

Develops systems and procedures for recruiting, selecting, classifying, and utilizing officer, enlisted, and civilian personnel to improve performance and retention. Serves as the Chief of Naval Operations' primary personnel survey resource to coordinate and conduct attitude surveys in the Navy and Marine Corps and to develop new survey technology.

- **Recruiting Systems** ↳ Develops market analyses, supply projections, and resource management models and systems to support accession policy and recruiting objectives.
- **Women and Minorities** ↳ Investigates issues associated with a racial-, ethnic-, and gender-mixed active duty and civilian force.
- **Officer Career Management** ↳ Develops and applies new technology to match officer attributes and billeting requirements in a changing environment.
- **Personnel Surveys** ↳ Develops systems to improve the quality and timeliness of personnel survey data.
- **Training Resources Systems** ↳ Develops computer systems to assess readiness against alternative training resource scenarios and to discover regularities in Navy manpower, personnel, and training (MPT) databases using expert system technology.

Recruiting Information Delivery System (RIDS)



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organizations' (e.g., Defense Manpower Data Center) programming staffs. Besides providing badly needed data for other recruiting R&D efforts, RIDS will serve as the software platform for several recruiting planning models also under development.

A RIDS prototype was developed and installed on 486-based personal computers at both PERS-23 and NRC. The prototypes contain a variety of historical data, including new recruit contracts, accessions, delayed entry pool levels by recruiting districts; similar DMDC production data by service; Bureau of Labor Statistics employment and unemployment data; Bureau of Census population data; recruiting resource data (recruiters, local and

In an environment of changing military priorities and uncertain personnel requirements, Navy recruiting managers and analysts at the Retention and Recruiting Branch of the Deputy Chief of Naval Operations (PERS-23) and the Navy Recruiting Command (NRC) must assess and forecast recruit market conditions, as well as justify and allocate scarce recruiting resources. In order to execute these tasks, analysis require a consistent source of easily accessible recruiting-related data.

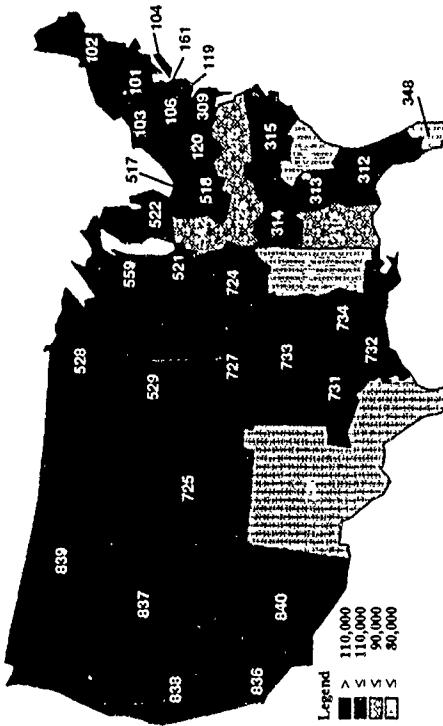
The Recruiting Information Delivery System (RIDDS) brings together an extensive collection of existing recruiting management data (e.g., demographic and economical conditions, educational status, recruiting production) with software that uses the stored data to generate additional data (e.g., rates, frequency counts) "on the fly." It also included interactive software that summons requested data quickly and displays it in either graphic or tabular form. RIDDS will reduce analysts' dependence on their own and other

national advertising); and education data (e.g., high school degree graduates). Users can retrieve a summary of key descriptive information for any of the 41 Navy recruiting districts (NRDs) through the QUICKSTATS option. RIDS also allows users to display NRD-level data in a geographic display (see diagram) to simplify the understanding of geographic trends.

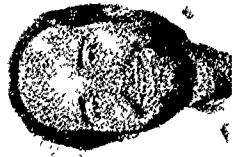
Future work will focus on expanding the databases and software interfaces, developing automatic update capabilities to ensure data timeliness, and installing RIDS on a local area network so that it can be shared simultaneously.

Program Element: 0603707N

Navy Recruiting Districts (NRDs) 17-21 Year Old Males



Equal Opportunity (EO)



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local EO climate annually as required by Navy regulations.

(e.g., Commanding Officers, Command EEO Deputies) satisfaction with the process.

Program Element: Reimbursable

Publications

The EO Climate survey identified discipline as an area where there are large racial/ethnic differences in perceptions of fairness and equity. The Navy's disciplinary system has been the focus of another research project. The study attempted to determine whether different discipline, advancement, and other-than-honorable discharge rates by racial/ethnic group are due to differences in behavior or systematic discrimination. An analysis of possible racial inequities of the Navy's disciplinary system was also conducted.

The integration and maximum utilization of minorities and women in the Navy's civilian and active-duty work forces remain a continuing challenge to the Navy.

Issues related to Equal Opportunity (EO) Climate, Sexual Harassment, and Equity in Discipline relevant to Navy military personnel are being studied. The first administration of the Navy EO Climate survey was conducted in 1989. The survey was completed by a sample of over 5,000 active duty officers and enlisted personnel. The second administration of this biennial survey will be conducted in 1991 and results compared to the original administration. This will allow Navy policymakers to be able to determine the degree to which policies and practices related to EO and prevention of sexual harassment have had an impact. Also, a computerized version of the survey is being developed to allow commands to survey their

deputy satisfaction with the process.

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Additional projects have focused on civilian Equal Employment Opportunity (EEO) issues. One civilian project focuses on EEO complaint investigations. The Navy spends an estimated 18 million annually to process EEO discrimination complaints. It is projected that the costs will increase in future years. Despite these costs, no mechanism exists for assessing the quality of EEO complaint investigation reports. The objective of this project is to develop and validate a survey that will enable the Navy to obtain accurate feedback regarding the quality of the complaints system. This should allow Navy policymakers to enact changes in the EEO complaints system, which should reduce costs and improve customer

*Edwards, J. E., & Thomas, P. J. (1989). Hispanics: When has equal employment been achieved? *Personnel Journal*, 68(6), 144, 147-149.*

*Edwards, J. E., Thomas, P. J., & Bower, J. L. (1989). *Moving for employment: Are Hispanics less geographically mobile than Anglos and Blacks?* (NPRDC-TN-89-11). San Diego: Navy Personnel Research and Development Center. (AD-A204 608)*

*Edwards, J. E., Rosenfeld, P., & Thomas, P. J. (1990). *Hispanics and Anglo males in the Navy's blue-collar civilian workforce: A comparison of new hires* (NPRDC-TN-90-24). San Diego: Navy Personnel Research and Development Center. (AD-A223 857)*

*Edwards, J. E., & Knouse, S. B. (1990). *Racial and ethnic-group differences in character-of-separation and disciplinary rates among first-term enlistees who are ineligible to reenlist* (NPRDC-TN-91-1). San Diego: Navy Personnel Research and Development Center.*

Lost Time of Men and Women



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(sea- vs. shore-intensive), and location (Continental U.S. vs. overseas). The women's survey also included additional questions that addressed sensitive issues associated with current and previous pregnancies.

In the past 15 years, the representation of women in the Navy has grown from 2 to 10 percent of the force. Greater utilization of women has resulted in new personnel issues, none of which is more thorny or emotional than pregnancy. In addition, issues associated with families, that the Navy had not fully addressed with a predominately male force, are becoming more intrusive. Single parenthood, for example, is frequently cited as being a growing military concern. Pregnancy and parenthood become personnel problems when they impact on flexibility of assignment, require special services, result in undue absenteeism, and impact on operational readiness.

As a first step in investigating the problems associated with pregnancy and single parents, the number of personnel involved was determined. A stratified random sample of enlisted women and men were surveyed to develop these statistics by paygrade, rating type

pregnant women and the impact of pregnancy on members of their workgroups.

A comparison was conducted of recorded lost time for a large sample of women and men. In addition, data collection occurred at 52 commands in the U.S. and overseas to investigate the impact of pregnancy and single parenthood on mission accomplishment. All of the data will be synthesized, analyzed, and interpreted.

Program Element: 0603707N

Publications

Thomas, M. D., & Lawson, S. (1989). *The effectiveness of sex education in the United States* (NPRDC-TN-89-23). San Diego: Navy Personnel Research and Development Center. (AD-A210 094)

Thomas, P. J., & Edwards, J. E. (1990). *Incidence of pregnancy and single parenthood among enlisted personnel in the Navy* (NPRDC-TR-90-1). San Diego: Navy Personnel Research and Development Center.

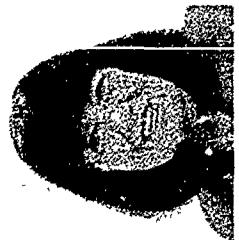
Thomas, M. D., Thomas, P. T., & McClintock, V. (1991). *Pregnant enlisted women in Navy work centers*. (NPRDC-TN-91-5). San Diego: Navy Personnel Research and Development Center.

The survey established base rates for pregnancy and single parenthood and lost time of

There are three major objectives for this effort. The first is to investigate the total amount of time lost due to pregnancy so that the impact of pregnancy on various Navy systems can be determined. It is necessary to establish the lost time of women who are not pregnant and of men to provide a comparison so that meaning can be attached to pregnancy statistics. The second objective is to investigate the impact of pregnancy on ships and deploying aviation squadrons. This phase of the project focuses on readiness and sea/shore rotation policies in submarine/destroyer tenders, Patrol (VP)/Fleet Air Reconnaissance (VQ) squadrons, and shore commands where women are concentrated. The third major objective is to investigate the intrusiveness of single parenthood and pregnancy upon the Navy as reflected by the need for preferential treatment, special assignment policies, or strategies to deal with problems associated with these conditions.

The survey established base rates for pregnancy and single parenthood and lost time of

Evaluation of the Navy's Consolidated Brig System



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A plan for evaluating processes and outcomes of the three-tier Navy Corrections Program has been designed and accepted by the Corrections and Programs Division (PERS-84). The evaluation plan specifies the methodology for assessing process strengths and weaknesses and for measuring outcomes to determine if the program is meeting its goals. System managers can then make informed decisions.

about staff attributes and organizational factors associated with the successful rehabilitation of Navy prisoners. The characteristics of prisoners who can benefit from retraining will be identified.

The 2 consolidated brigs and 10 waterfront brigs are now participating fully in evaluation efforts and implementation continues at the remaining sites.

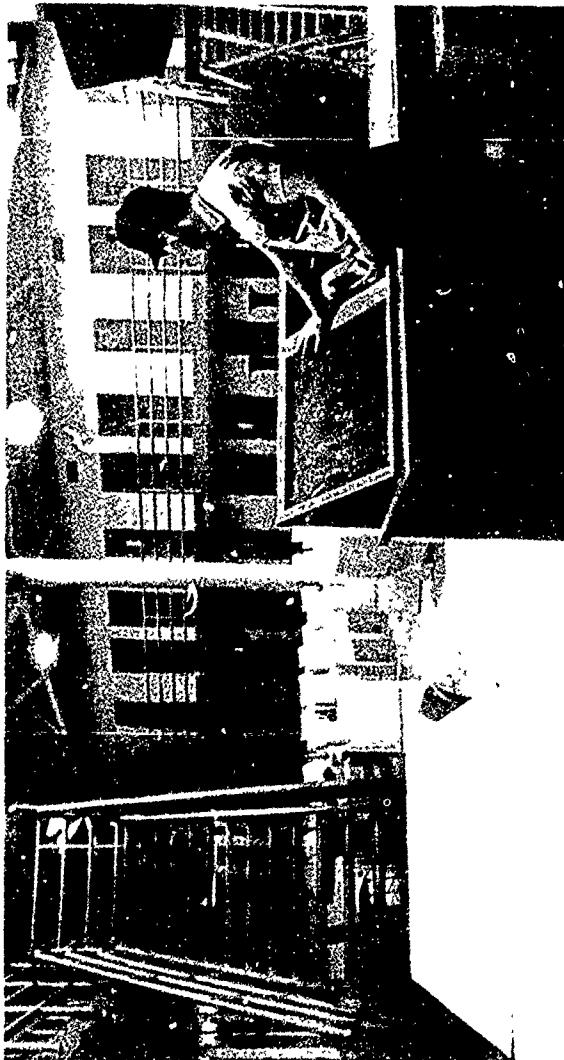
The evaluation allows program managers to monitor classification, retraining, and security procedures at each of the Navy correctional facilities and to determine the success of various retraining interventions intended to return selected offenders to productive active duty. The system also provides information

The Navy is in the process of revising its correction programs, with the goal of restoring a larger percentage of prisoners to active duty following the completion of their sentences. Better methods for assessment and classification of offenders will be implemented, along with additional programs for rehabilitating those with the potential to be productive sailors. Three newly constructed consolidated brigs and eight renovated waterfront brigs will be better able to utilize limited personnel and professional services.

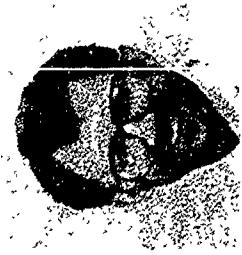
The changes to be implemented will utilize recommendations from the American Corrections Association on operating procedures, training programs, and systematic classification of detainees and prisoners. To assure that this revised correctional system is meeting its goals and to assess the effectiveness of the specialized programs being implemented, an evaluation plan with a system for data collection is necessary.

Program Element: Reimbursable Publications

Kerce, E.W. (1990). *Navy corrections program evaluation: Volume I: Design* (NPRDC-TR-89-17). San Diego: Navy Personnel Research and Development Center. (AD-A213 360)



Officer Staffing



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- previously administered interest inventories. Additionally, algorithms were developed to combine the myriad predictors into a selection composite score that is predictive of several criteria (e.g., academic and military performance while at the USNA or in the NROTC).
- The Selection Systems for Changing Organizations project shifted the emphasis of the Officer Staffing program to adapting the selection technology base to other officer programs (e.g., medical) and predicting longer-term and more job-oriented criteria. Because substantial resources are invested in recruiting, selecting, and training Navy officer candidates, it is especially important that the USNA and NROTC selection systems consider whether an applicant is likely to extend beyond the initial obligation.
- The leader-staffing problems and opportunities commonly found in civilian organizations are magnified by the size of the Navy and the gravity of its mission. To efficiently address officer staffing issues, a unified research program is needed that transitions from identification of basic problems and development of prototype instruments/systems to the implementation and documentation of new procedures, systems, and policies. This systemic approach for investigating officer staffing must be capable of simultaneously examining the diverse personnel functions (e.g., selection, assignment, and promotion) encompassed under the staffing rubric to arrive at a uniform officer-staffing system.
- The Integrating Officer Selection Systems project improved the officer candidate selection systems used for the U.S. Naval Academy (USNA) and the Naval Reserve Officers Training Corps (NROTC). New biographical data forms and behaviorally-based interview systems were constructed for each of the two officer candidate programs. Also, special scoring keys were created using item data from
- applicants (NPRDC-TN-91-3). San Diego: Navy Personnel Research and Development Center.
- Burch, R. L., Sheposh, J. S., & Morrison, R.F. (1991). *Officer career development: Surface warfare officer retention* (NPRDC-TR-91-5). San Diego: Navy Personnel Research and Development Center.
- Devlin, S. A., & Abrahams, N. M. (1990). *Assessment of differential prediction by race for the USNA classes of 1986-1990* (NPRDC-TN-91-2). San Diego: Navy Personnel Research and Development Center.
- Kantor, J. (1989). *The utilization of biographical information for the reduction of motivational attrition in the NROTC scholarship program* (NPRDC-TN-89-21). San Diego: Navy Personnel Research and Development Center.
- Kozlowski, S. W., & Morrison, R. F. (1990). *Officer career development: Mapping rater strategies in officer fitness report ratings* (NPRDC-TR-91-2). San Diego: Navy Personnel Research and Development Center. (AD-A231 304)
- Owens-Kurtz, C. K., Bowman, W. C., Gialluca, K. A., Abrahams, N. M., & Matuson, J. D. (1989). *Refinement of the Naval Reserve Officer Training Corps (NROTC) scholarship selection composite* (NPRDC-TN-90-1). San Diego: Navy Personnel Research and Development Center. (AD-A216 568)
- Russell, C. J., Matuson, J., Devlin, S. E., & Atwater, D. (1990). Predictive validity of biodata items generated from retrospective life experience essays. *Journal of Applied Psychology*, 75(5), 546-580.

U.S. Naval Academy (USNA) Midshipmen Selection



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Academy database. First, selection scores, test data, and demographic information for each incoming class are added to the database. Second, criterion information (performance measures), such as grades, choice of major, and attrition data are added at the end of each semester for the four current classes. Finally, to permit the evaluation of selection procedures and their effectiveness in predicting the retention and performance of Naval Academy commissioned officers, information is extracted annually from the officer master file, attrition, and fitness records.

The cost and difficulties associated with recruiting, training, and retaining high quality, technically oriented career officers continue to escalate. The total cost of educating and training each midshipman commissioned by the Naval Academy has grown from an average of \$76,000 in 1975 to current costs exceeding \$150,000. Clearly, it is important to select Naval Academy midshipmen likely to graduate and contribute effectively as naval officers.

(2) designed a directory system using Structured Query Language (SQL) on the IBM mainframe that permits researchers to query the system online to locate any data sets within the Naval Academy database; (3) updated the documentation for the entire system (online and hard-copy versions); (4) validated current selection procedures as of June 1990, (5) presented results to the Naval Academy Dean of Admissions, and (6) provided assistance to the Academy in implementing any changes to the selection composite and the selection procedures in general.

The second phase covers the validation of the current selection procedures as well as the preparation of the tables, charts, and figures to communicate the results to the Naval Academy selection board.

Additionally in FY91, at the request of USNA Admissions, an extensive project will be conducted to permit comparisons between the major Navy sources (USNA, Naval Reserve Officer Training Corps (R), Officer Candidate School, etc.) on such criteria as continuation rates and fitness reports. Within the sources, comparisons will also be made by warfare specialty, officer community, gender, and race.

Previous research and development efforts provided empirically-based procedures for selecting Naval Academy midshipmen. The objective of this work is to provide the necessary support to monitor, maintain, and improve the effectiveness of those selection procedures now that they have been implemented.

This research proceeds in two phases: The initial phase covers the updating of the Naval

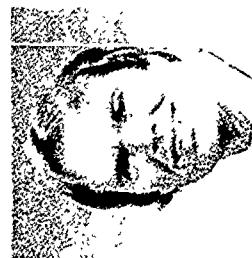
Future plans include: (1) continue to refine, enhance, and update the newly-designed Naval Academy database; (2) update the four current classes in June 1991 and install the Class of 1995 data in the system; (3) validate current selection procedures as of June 1991; and (4) provide assistance in implementing procedural changes for selecting the Class of 1996.

Program Element: Reimbursable Publications

Neumann, I., Matuson, J. D., & Abrahams, N. M. (1989). *Development and evaluation of an officer potential composite* (NPRDC-TR-89-18). San Diego: Navy Personnel Research and Development Center.

Accomplishments to date: (1) completely redesigned the database to format separate data sets in a uniform fashion that encompass all classes from 1971 to the present Class of 1994.

Officer Assignment Decision Support System (OADS)



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data elements as well as levels of information contained in them. Based on these judgments, new data elements will be established, relative values attached, and a DSS developed. Prototype "modules" (subsystems) of the Officer Assignment Decision Support System (OADS) will be pilot-tested for adaptability, effectiveness, and acceptance.

The task of Marine Corps officer monitors is to simultaneously accommodate the needs of the Corps and the desires of the individual officers in the assignment process. Performance of this task requires concurrent consideration of the skills and attributes of the officers being assigned and the job dimensions of available billets. A user-friendly, interactive decision support system that is based on comprehensive, reliable information would assist monitors in implementing the U.S. Marine Corps (USMC) staffing policy and enhancing the person-job match.

The objective of this effort is to develop a decision support system (DSS) for officer monitors that includes relevant, reliable information about officers and billets. This approach involves evaluating the data elements required by monitors to make assignments and capturing their decision-making rules. A variety of other factors affecting the assignment process will be investigated as well. USMC manpower experts will judge the criticality of existing and proposed

JOMO subsystems with OADS, and drafting of a comprehensive users manual.

Future plans include converting OADS from a 3Com LAN installation to a Banyan LAN installation (to support Marine Corps standardization efforts), developing a hypertext-based lesson for inclusion in CAMT, evaluating the feasibility of using optically scannable questionnaires to collect assignment-relevant data from officers, and drafting a system maintenance manual.

Program Element: 0603732M

Publications

Chatfield, R. E., & Gullett, S. A. (1989). *Development of a USMC officer assignment decision support system: Functional description*. (NPRDC-TN-89-32). San Diego: Navy Personnel Research and Development Center. (AD-A213 310)

Chatfield, R. E., & Gullett, S. A. (1990).

Development of a USMC officer assignment decision support system: Data requirements (NPRDC-TN-90-12). San Diego: Navy Personnel Research and Development Center. (AD-A220 787)

Chatfield, R. E., & Gullett, S. A. (1991). *Development of a USMC officer assignment decision support system: General design specification* (NPRDC-TN-91-4). San Diego: Navy Personnel Research and Development Center. (AD-A231 302)

JOMO subsystems with OADS, and drafting of a comprehensive users manual.

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Program Element: 0603732M

Publications

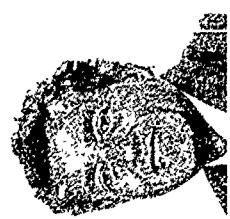
Chatfield, R. E., & Gullett, S. A. (1989). *Development of a USMC officer assignment decision support system: Functional description*. (NPRDC-TN-89-32). San Diego: Navy Personnel Research and Development Center. (AD-A213 310)

Chatfield, R. E., & Gullett, S. A. (1990).

OADS microcomputer-based subsystems presently operational at HQMC include: (1) Special Education Program (SEP), (2) General Officer Assignment Locator System (GOALS), (3) Computer-aided Monitor Training (CAMT), and (4) Joint Officer Monitor Officer (JOMO).

Recent work completed includes test/evaluation of OADS on HQMC's Local Area Network (LAN), integration of the SEP and

Navy Personnel Survey System (NPSS)



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as a clearing house, and coordinates all surveys administered to Navy military personnel and dependents.

The NPSS will improve the quality and timeliness of personnel survey information and reduce intrusion on Navy commands, possible redundancy, and data collection costs. This is accomplished by the establishment of a systematic program which includes the development and implementation of good survey

management practices, increased use of computerized surveys, development of sophisticated sampling strategies, and institutionalization of two recurring surveys.

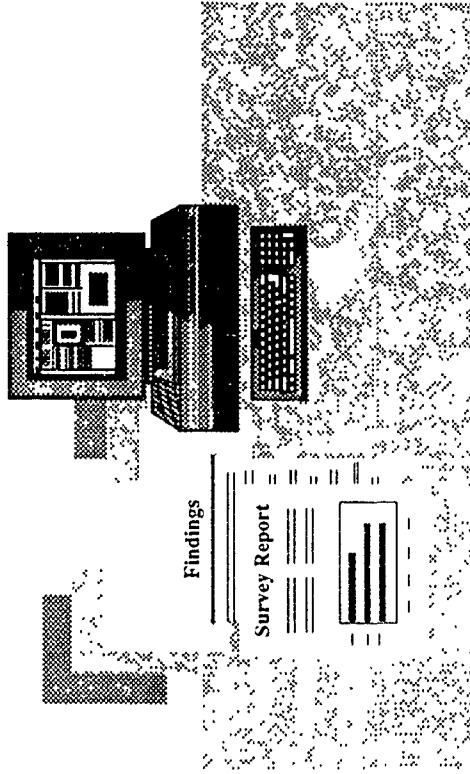
The components of the NPSS are described below:

1. Annual Navy Personnel Survey (NPS) provides a representative "snapshot" of the attitudes and opinions of the entire

Until recently the Navy had no institutionalized system for obtaining and analyzing attitudinal data from officer and enlisted personnel. Information was obtained through ad hoc surveys, which provided little basis for comparison, were frequently completed on an untimely basis, and did not provide an early-warning system of potential recruiting, attrition, or retention problems. These surveys did not provide ongoing data for monitoring the impact of quality of life and related policy initiatives, did not facilitate our ability to monitor the effectiveness of recruiting initiatives, minimally impact upon our ability to forecast attrition and retention, and did not provide the solid data required for new policy development. The lack of such data diminished our ability to credibly argue budgetary and related issues and, more critically, respond to the needs of our personnel.

State-of-the-art Technology

Computerized Surveys
Telephone Surveys
Scannable Surveys
Focus Groups
FAX Surveys
Interviews



As a result, the Navy Personnel Survey System (NPSS) was established. The system conducts attitude and opinion surveys, serves

population with minimum intrusion into their workload. This data is collected on a regular (annual) basis from a representative sample of personnel and is used to analyze emerging trends in job satisfaction, organizational effectiveness, and attitudes toward military personnel policies and practices. The sample size is approximately 25,000. This allows oversampling of certain subpopulations (e.g., women, minorities) to ensure accurate results from these groups as well as the entire officer and enlisted force. The NPS survey contains three types of questions: (1) core job satisfaction, organization effectiveness (e.g., leadership), and career questions, which would be repeated in each survey; (2) questions of interest to program managers (e.g., retention, attrition, benefits, etc.), which would be repeated in each administration; and (3) "hot items" of interest at the time of the survey (e.g., spouse employment, equal opportunity, etc.), which may not be repeated in subsequent surveys. One important feature of the survey is the active participation of program managers in the development of the survey instrument. Because the data is collected from a sample of people who represent a cross-section of Navy

people with different backgrounds who are at varying points in their careers and decision paths, information can be collected relevant to important issues (e.g., retention, attrition) and trends can be tracked over time. By using such a sample, potential "hot spots" can be resolved before having an effect upon the retention/attrition decisions of the individual. The first NPS was administered from October to December 1990.

2. New Recruit Survey (NRS) will eventually be administered to all enlistees who are in basic training. The survey asks about reasons for joining the Navy (influence of advertising, recruiters, relatives, friends, incentives, etc.). It queries respondents regarding their career plans and expectations. The data gathered is valuable in assessing accession policy issues, profiling new enlistees, and looking for trends in Navy accession. The questionnaire for this survey has been developed, pilot tests have been conducted, and all preliminary results have been analyzed.

In addition to the institutionalized surveys, Special Surveys are conducted as requested by

program managers. Typically, these surveys address focused issues (e.g., the impact of Desert Storm on naval reservists).

Special Surveys rely on several data collection techniques, such as focus groups, personal interviews, computerized surveys, and computer-assisted telephone interviews. One or more of these techniques will be used depending on the requirement (e.g., time frame, purpose of survey).

A Survey Information Management System (SIMS) is being developed and will include raw data from selected surveys. This will enable NPRDC to answer inquiries about survey data and possibly preclude the need for new surveys. When requested, NPRDC will do secondary data analysis to answer or respond to special requests or requirements. In addition, a yearly progress report on survey activities will be presented to the Chief of Naval Personnel. This report will include a listing of surveys, a description of results, a summary of topic areas, and a synopsis of the data (including trends, problem areas, etc.).

Program Element: Reimbursable

Computer Enhanced Navy Survey System (CENSUS)



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world-wide automated survey system for Navy civilians. Surveys responsive to policy makers' requirements will be administered on a periodic basis; responses will be integrated with existing computerized personnel databases and will be analyzed providing rapid results.

The technological objectives of CENSUS are to improve survey design in the context of computer technology. Because microcomputer technology permits surveys to be administered and analyzed in an efficient manner, many survey design issues may be easily addressed. These include response effects (e.g., length and working of questions) and response styles (e.g., social desirability, response strength). While these effects have been documented in the literature for traditional paper-and-pencil surveys, their effects have not been systematically studied in the context of computer technology.

One major problem facing policy makers in the Navy Office of Civilian Personnel Management (OCPM) is the continual need to obtain timely and accurate information about the work force. They must gather attitudinal information about issues that affect the working lives of the 350,000 Navy civilian employees world-wide. Presently, opinions and attitudes of personnel are assessed in response to a specific situation or need using paper-and-pencil surveys mailed to a sample of civilians. Generally, by the time results are available, the reason for gathering the information is obsolete and the data are out of date and no longer relevant. Clearly, a system to gather attitudinal data that is fast, useful, reliable, and accurate is needed.

The Computer Enhanced Navy Survey System (CENSUS) is being developed as an automated survey system that is cost-effective and affords policy makers timely and accurate information concerning attitudes of the civilian work force. The overall objective of this research is to develop, test, and implement a

administration software installed locally. POCs administer the survey to a preselected sample of civilian personnel and return the results to NIPRDC via the BBS. This eliminates the need for mailing diskettes.

The BBS system was used to conduct the first Navy Civilian Personnel Survey (NCPS) in November 1989. The NCPS is an omnibus survey that will be administered each year to a representative sample of civilian personnel to obtain their attitudes and opinions about job satisfaction as well as current and proposed manpower policies and programs. Data from year-to-year will be compared to identify emerging trends.

Program Element: 0603707N

Publications

Murphy, D. J., Tyburski, D. A., Somer, E. P. (1991). *Office of Civilian Personnel Management survey of Navy civilian attitudes December 1989: Findings*. (NPRDC-TR-91-9). San Diego: Navy Personnel Research and Development Center.

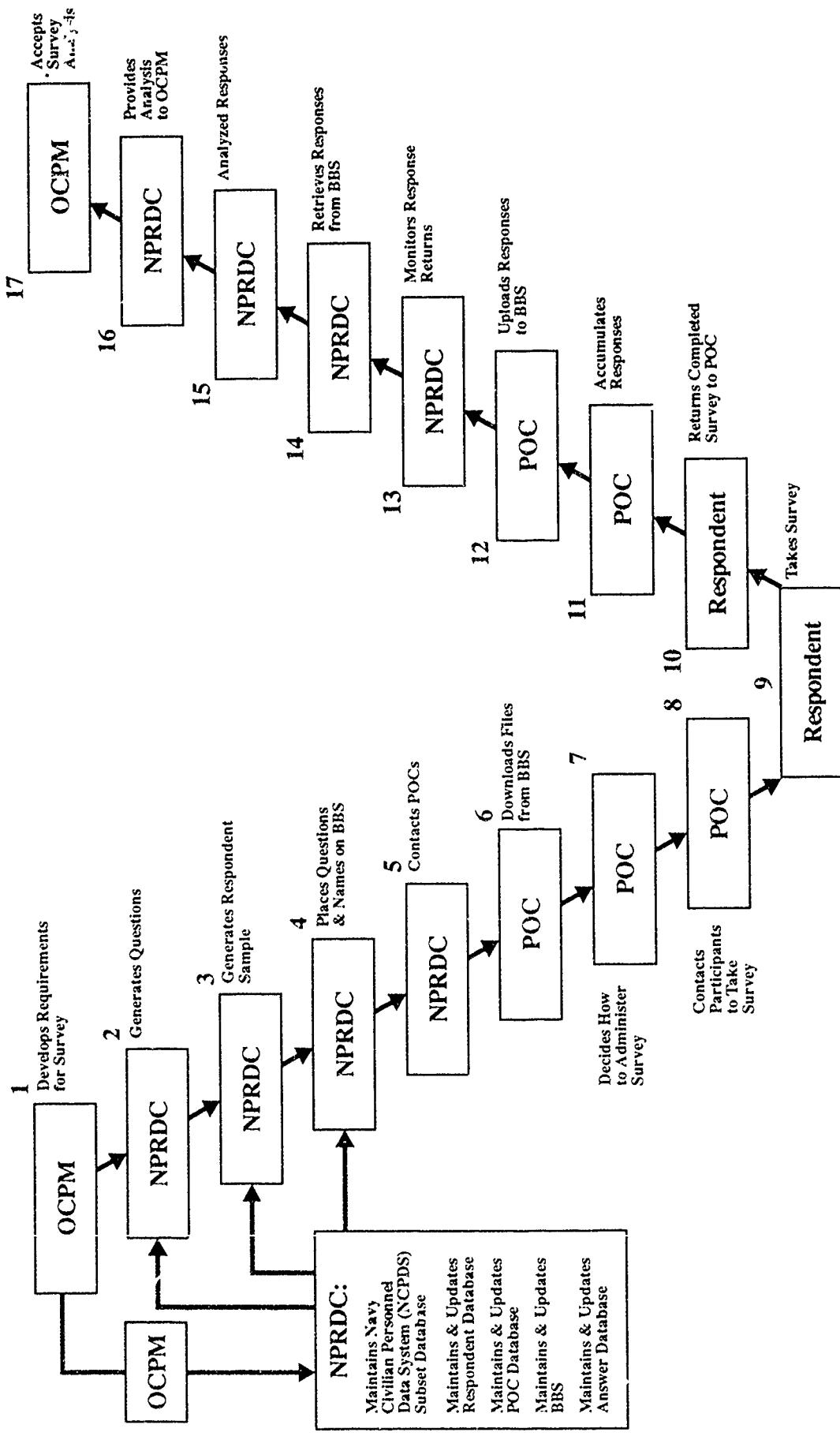
Rosenfeld, P., Doherty, L. M., Vicino, S. M., Kantor, J., & Greaves, J. (1989). Attitude assessment in organizations: Testing three microcomputer-based survey systems. *The Journal of General Psychology*, 145-154.

Tyburski, D. A., Petrey, J. L., Wilson, S., & Kewley, B. (1989). *OCPM-CENSUS bulletin board system user's manual* (NPRDC-TN-90-6). San Diego: Navy Personnel Research and Development Center.

Two versions of CENSUS have been developed. One is a diskette-based survey system that can be mailed directly to respondents for use on a microcomputer. The diskettes can be returned to NIPRDC for direct input to computerized statistical analysis programs. This reduces the time to complete survey analysis and reduces the chance of error in data manipulation.

The second version uses an electronic bulletin board system (BBS) to transfer surveys to preselected points of contact (POC) at Navy Civilian Personnel Offices. The POCs combine BBS transmitted files with survey

CENSUS Electronic Bulletin Board System (BBS) Survey Process



Training Resources Management (TRM)



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been used to obtain de facto "C" school pipelines, model "A" school attrition, analyze first-term attrition, provide training histories for submariners, and identify prior service personnel for reserve and active duty recruitment.

To improve the Navy's ability to plan for "A" and Navy Enlisted Classification (NEC) "C" school throughput, the TRM project is developing computer systems for training planners. The prototype NEC "C" school system will balance fleet requirements against historical school inputs and utilization to generate the plan; future enhancements will estimate NEC supply and will allow users to analyze alternative input-output scenarios. The "A" school system will be based upon the

Relating Navy training resources to fleet readiness currently involves a mixture of models and manual calculations. The calculations are complicated by inexact data on fleet requirements in the out-years, volatile inventories, conflicting objectives, and imprecise training costs. As a result, it is very difficult for planners to calculate the effects of alternative training plans and to estimate and defend training costs.

The Training Resources Management (TRM) project has developed an historic, longitudinal database of individual training episodes from 1979 to the present. This Enlisted Training Tracking File (TRAIN-TRACK) merges data from the Student Master File (SMF), the Survival Tracking File (STF), Chief of Naval Education and Training (CNET) cost files, and the Support Program for Incentive, Retention, and Training (SPIRIT) database. Merged data are organized by social security numbers so that an individual's entire training can be examined. TRAINTRACK has

technology developed for the NEC "C" school planning system. These systems will lead to a more efficient allocation of training resources.

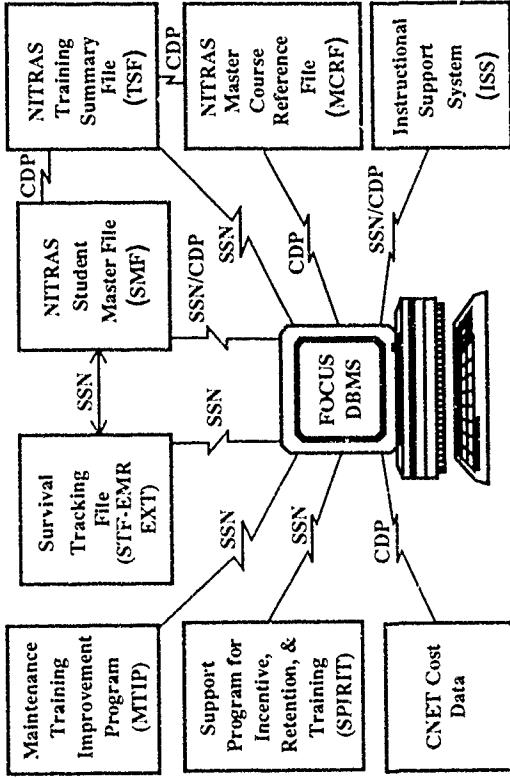
Program Element: 0603720N

Publications

Nakada, M. K., Milczewsky, W., & Wax, S. R. (1989). *Enlisted Training Tracking File (TRAINTRACK)* (NPRDC-TN-90-2). San Diego: Navy Personnel Research and Development Center. (AD-A214 984)

Sorensen, S. (1991). *Developing and implementing the NEC "C" School planner (CSCHOOL)* (NPRDC-TR-91-3). San Diego: Navy Personnel Research and Development Center. (AD-A230 730)

TRAINTRACK System



Testing Systems

Function and Product Line Descriptions

Develops and evaluates systems for personnel selection and classification testing, performance measurement, and person-job matching. Serves as the lead DoD laboratory for the development of a Computerized Adaptive Testing version of the Armed Services Vocational Aptitude Battery (CAT-ASVAB) and the Adaptability Screening Profile Program. Manages and performs R&D and scientific support for these and other programs including the Navy portion of the Joint-service Job Performance Measurement Program and the operational paper-and-pencil ASVAB.

- **Printed Testing** ⇒ Establishes and monitors Navy enlistment qualification and school standards for the ASVAB. Develops biographical information instruments for use in enlisted personnel screening.
- **Computerized Testing** ⇒ Develops CAT-ASVAB as a replacement for the paper-and-pencil version of the battery. Includes development of new computerized ability tests which can be used to augment the battery.
- **Personnel Classification** ⇒ Develops job performance measures for use in validating selection and classification tests. Develops mathematical modeling procedures to assist in establishing recruit quality requirements and person-job matching techniques.

Armed Services Vocational Aptitude Battery (ASVAB)



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Technical Committee of the MAPWG and provides assistance to Navy personnel policy makers on ASVAB testing matters.

The objectives of the Navy's effort are to: (1) validate the ASVAB as a tool for improving standards for school assignment, (2) assist in a joint effort with other services to develop new test forms and to make other necessary improvements to the ASVAB testing program, and (3) validate the ASVAB against measures of job performance, in addition to academic performance in Class "A" schools.

Armed Services Vocational Aptitude Battery (ASVAB) is a joint-service multiple aptitude battery used for selection of applicants and assignment of those selected into military occupations. The Armed Forces Qualification Test (AFQT), formed from 4 of the battery's 10 tests, is used for selection, while 11 different Class "A" school composites formed of the 10 tests are used for assignment. The ASVAB is administered at the Military Entrance Processing Stations (MEPS) and at the Mobile Examining Test Sites (METS). Following introduction of the ASVAB testing program, the Manpower Accessioning Policy Working Group (MAPWG) was established to: (1) involve the services in ASVAB-related selection and classification decisions, (2) coordinate the research efforts of the individual services, (3) concentrate the personnel resources of all service laboratories in resolving common testing problems, and (4) provide for the development of replacement test forms, as well as the overall maintenance of the ASVAB program. NPRDC provides a representative to the

Form 8A, the results can be used in the same manner as previous forms. In another study, the Optical Mark Readers (OMR), which are used for scoring ASVAB answer sheets, will be replaced by upgraded OMRS. As a result, new ASVAB answer sheets will be used, requiring an equating to the current answer sheets. NPRDC is in the process of verifying the equating of the new answer sheets. Validation of ASVAB school composites has recently been completed for several Class "A" schools.

A three-phase effort is underway to review the Navy's Class "A" school classification system. In the first phase, data were collected at 22 Class "A" schools and the current ASVAB school selector composites validated. In the second phase, data were gathered on an additional 27 schools and a data analysis plan developed for execution in the final phase. These data were merged with other data to form a pool representing 81 of the approximately 95 Class "A" schools. The objectives of the final phase are to: (1) assess the validity of the current ASVAB selector composites used to classify students into 81 schools, (2) reduce the number of ASVAB composites from the present level, and (3) identify a single best composite for schools currently using more than one composite.

NPRDC was responsible for developing the Automated ASVAB Analysis System (AAAS). The objectives were to: (1) automate the manual operations that must be performed during the validation of selector composites,

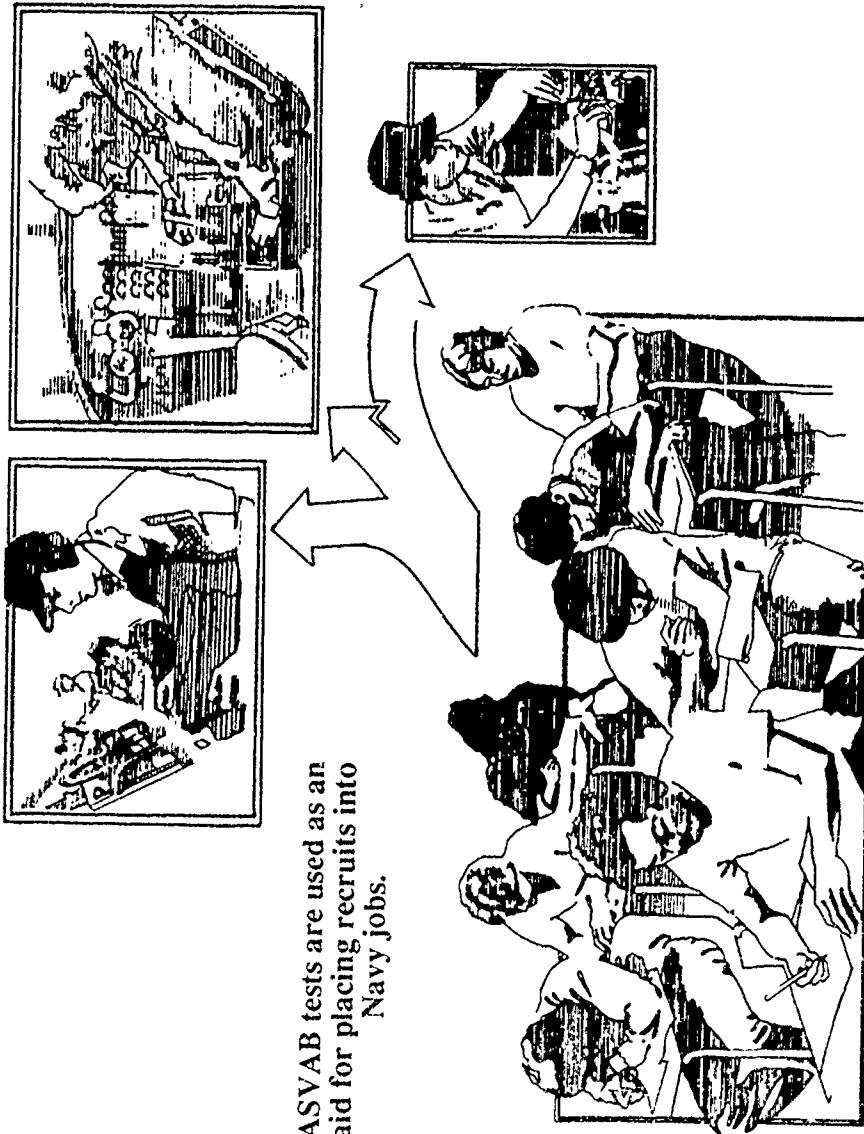
(2) make the file names that are used in the process generic, and (3) reduce, by at least 40 percent, the time required to complete the data analysis portion of an ASVAB composite validation study. In addition to validation analysis, the AAAS performs post-validation analyses and provides critical decision-making information such as expectancy tables. The AAAS has been used in the last four validation

studies and will be used as part of the data analysis plan for simplifying Navy classification.

Program Element: Reimbursable Publications

validation study. In addition to validation analysis, the AAAS performs post-validation analyses and provides critical decision-making information such as expectancy tables. The AAAS has been used in the last four validation

- Battery (ASVAB) in Dillon, R.F., Pellegrino, J. W. (Eds.), *Testing: Theoretical and Applied Perceptions*. New York: Praeger Publishers.
- Held, J. D., & Foley, P. P. (in process). *Validation of the ASVAB for the BT/MMEN Class "A" School*. San Diego: Navy Personnel Research and Development Center.



ASVAB tests are used as an aid for placing recruits into Navy jobs.

Adaptability Screening Profile



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constructed and administered to a national sample of 200,000 armed forces applicants. Of this group, 55,675 active duty accessions from the applicant cohort were tracked through their first term enlistment. ASAP item responses were compared between service completers and attrites to develop a scoring key. Cross-validation in an independent sample demonstrated considerable incremental validity of the ASAP in relation to existing military enlisted selection standards (high school diploma and Armed Forces Qualification Test or AFQT). If the ASAP were used to augment the enlisted selection system, the prediction of the annual number of 36-month service completions would be increased by 3,000 or more.

The U.S. Congress and the Government Accounting Office (GAO) have requested an improvement in the personnel quality indicators that define enlisted selection standards, including a reduction in the general reliance on a high school diploma as a discriminator. NPrDC has been tasked by the Office of the Assistant Secretary of Defense (Force Management and Personnel) as lead laboratory in the development of a joint-service adaptability screening instrument.

The global objective of this project is to improve enlisted personnel screening by differentiating applicants in terms of their potential adaptability to military service. The specific objectives are to: (1) develop a self-report biographical questionnaire that can be used by all services, (2) validate the instrument against a completion of service criterion, and (3) incorporate adaptability screening into the existing recruiting and examination systems.

Two experimental versions of the Armed Services Applicant Profile (ASAP) were

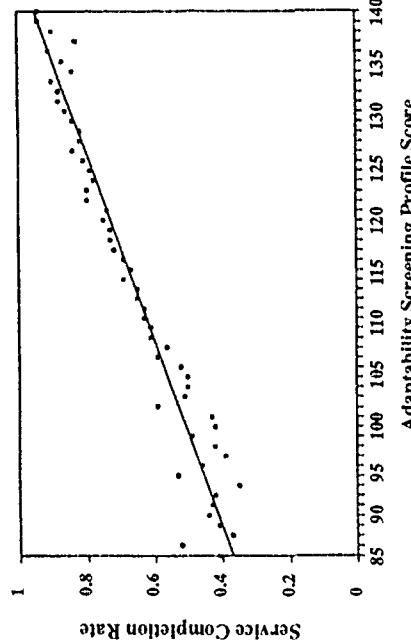
Work completed: (1) developed all testing materials and procedures for operational use, (2) fairness analyses, (3) quality impact analyses, and (4) operational monitoring system.

In the future, the ASAP instrument will be integrated with other aptitude, education, and demographic variables to form attrition prediction formulas that will form the basis of a new enlistment screening system (Compensatory Selection Model or CSM).

Program Element: Reimbursable

Publications

Trent, T. (in process). *Armed Services Applicant Profile (ASAP): Development and validation*. San Diego: Navy Personnel Research and Development Center.



Computerized Adaptive Testing for ASVAB (CAT-ASVAB)



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The purpose of this research and development (R&D) program is to develop, test, and evaluate a Computerized Adaptive Testing version of the battery (CAT-ASVAB) as a potential replacement for P&P-ASVAB. Work is proceeding simultaneously in two areas, psychometric research and delivery system development.

The Armed Services Vocational Aptitude Battery (ASVAB) is used by all U.S. military services to determine enlistment eligibility and to classify selected applicants into entry-level training. The current version of this aptitude battery consists of 10 tests and is administered in a paper-and-pencil mode (P&P-ASVAB). Due to this conventional administration mode, P&P-ASVAB has a number of important shortcomings including (1) inability to employ dynamic test questions (e.g., target acquisition and tracking), (2) lengthy test administration time, (3) a lack of measurement precision at the high- and low-ends of the ability continuum, (4) susceptibility to theft and test compromise, (5) high costs for printing, distribution, and storage of test materials, and (6) long lead time and high cost of developing replacement forms.

The fifth field activity, Score Equating Verification (SEV), is currently in progress. The purpose is to re-equate CAT-ASVAB using a motivated sample of military applicants. CAT-ASVAB is being administered to military applicants at selected Military Entrance Processing Stations (MEPS) and their satellite Mobile Examining Team Sites (METS). The CAT-ASVAB scores for these applicants are being used to make enlistment decisions.

Both of these R&D areas support the Accelerated CAT-ASVAB Project (ACAP). ACAP was instituted to get CAT-ASVAB into the field with off-the-shelf hardware rather than incurring a major delay that would result if computer hardware were developed specifically for the project.

ACAP involves five major field activities, four of which have been completed. The first, a pretest of the delivery system, was designed to assess human factors issues. The second, a medium of administration study, investigated the impact of administering questions via computer vice paper-and-pencil. The third field activity, cross-correlation, assessed the statistical reliability of CAT-ASVAB. The fourth, score-equating development, developed tables equating CAT-ASVAB scores to P&P-ASVAB scores. Results of these four studies support implementation of CAT-ASVAB as a replacement for P&P-ASVAB.

Concurrent with the CAT-ASVAB evaluation is an evaluation of Enhanced Computer Administered Tests (ECAT). ECAT is a battery of tests that measures abilities not currently measured by the ASVAB. Currently, a joint-service study is being conducted to evaluate the potential increase in validity that could result from adding some of these tests to the current ASVAB tests.

The tests will be available for implementation upon completion of SEV and the ECAT joint service validity studies.

Program Element: 0604703N and Reimbursable Publications

Segall, D. O., Moreno, K. E., Bebb, L. E., & Kieckhaeffer, W. F. (in press). *An evaluation of the validity of the experimental CAT-ASVAB*. San Diego: Navy Personnel Research and Development Center.

Cognitive Process Assessment



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The validity of aptitude tests may be improved by examining the strategies or processes by which the examinee arrives at an answer, not just the final answer itself. For example, even when two individuals arrive at the correct answer, there may still be substantial individual differences in how efficiently it was obtained. Only some examinees seem able to "see the big picture" and take advantage of all available information about certain tasks. Also, examinees differ in their ability to recognize problems that they have solved, so that they can immediately recall the correct solution rather than repeat all the individual problem steps.

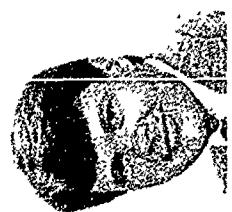
Congress is concerned with reducing military personnel costs and improving job performance. The services use tests (e.g., the Armed Services Vocational Aptitude Battery or ASVAB) to select and classify personnel for specialized training. The ASVAB currently predicts only about 25 percent of the variance in school or job performance. Better aptitude tests are needed that are: (1) relatively independent of a person's acquired knowledge, (2) better measures of a person's true potential, and (3) better predictors of job performance.

A recent study was completed for NRPDC that was designed to determine how much increase in validity over the ASVAB could be attained by adding new predictors and what the utility would be of such a validity improvement. It was estimated that validity could be increased by at least 3 percent (e.g., a validity increased from .59 to .61) and that would result in the equivalent of \$83 million annually in performance improvement in the Navy. The savings occur because the additional validity will result in selection of

more effective personnel. Thus, increased test validity could have a large impact in terms of monetary costs and fleet readiness.

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- Larson, G. E., & Alderton, D. L. (1990). Reaction time variability and intelligence: A "worst performance" analysis of individual differences. *Intelligence*, 14, 309-325.
- Larson, G. E., & Alderton, D. L. (in press). The structure and capacity of thought: Some comments on the cognitive underpinnings of g. In D. K. Detterman (Ed.), *Current Topics in Human Intelligence: Vol. 2*.
- Larson, G. E., Alderton, D. L., & Kaupp, M. A. (1991). Dynamic administration of a general intelligence test. *Learning and Individual Differences*, 3, 123-134.
- Larson, G. E., & Latkin, K. E. (1989). Discriminant validity and information processing: The case of "verbal correlates." *Personality and Individual Differences*, 10, 1185-1188.
- Larson, G. E., & Merritt, C. R. (1991). Can accidents be predicted? An empirical test of the Cognitive Failures Questionnaire. *Applied Psychology: An International Review*, 40, 37-45.
- Larson, G. E., & Saccuzzo, D. P. (1989). Cognitive correlates of general intelligence: Toward a process theory of g. *Intelligence*, 13, 5-33.
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New Measures of Intelligence for Selection and Classification



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Most "new test" research has been exclusively funded with either basic research or exploratory development funds. However some of this research, especially with respect to particular tests, has matured to the point where advanced development funds were needed for further development and large scale validation. This is the "new test" research and development territory filled by the New Measures of Intelligence project. The project is related to the exploratory development funded project, Cognitive Process Assessment, and aspects of the Computerized Adaptive Testing version of the Armed Services Vocational Aptitude Battery (CAT-ASVAB) program. The

ASVAB. While the ASVAB predicts roughly 25 percent of the variance in school and job performance, there is room for improvement. The logic of this "new test" research has been two-fold. First, although the ASVAB does an admirable job of assessing verbal, mathematical, and some types of technical abilities, this is not a complete sampling of the entire sphere of human intelligence that may have significant predictive value for the Navy. Therefore, many of the experimental tests have been designed to expand the range of aptitudes measured by the ASVAB, aptitudes which can only be measured through computer-controlled testing. Additionally, some computer-based tests have been developed specifically to provide better measures of abilities currently tapped by the ASVAB (e.g., clerical/perceptual speed).

program covers the administration of computerized aptitude tests to recruits and active-duty personnel, collection of criterion data for test validation, development of large and complex databases for test evaluation, and extensive statistical analyses to determine the efficacy and validity of new experimental test batteries.

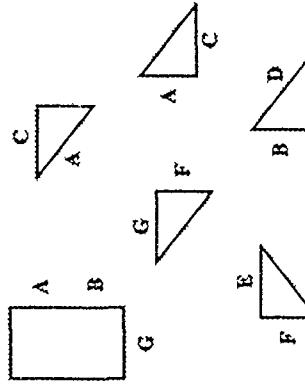
Program Element: 0603707N

Publications

Alderton, D. L., & Larson, G. E. (1996). The dimensionality of Raven's Advanced Progressive Matrices Items. *Educational and Psychological Measurement, 50*, 887-900.

Compute-controlled Testing

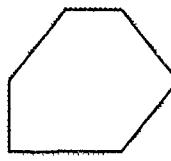
Connect the matching letters to build a final shape.
Remember this shape.



<< PRESS THE ENTER KEY TO CONTINUE>>

First Screen

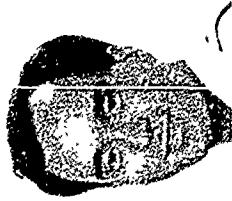
If this shape matches the one you just built and remembered, then



Press A [same] or E [different]

Second Screen

Systems Model of Navy Accession and Classification (SYMONAC)



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The objective of this research is to develop a Systems Model of Navy Accession and Classification. (referred to as SYMONAC).

The model is intended for use in planning and optimization. Navy manpower research has historically focused on the improvement of specific elements within the general selection and classification system, rather than optimization of the system as a whole. SYMONAC is intended to offer an alternative integrated approach for investigating personnel selection and classification improvements.

Take, for example, research on improving training school performance through the revision of school selector composites. New composites with higher predictive validity for school performance measures are implemented in place of older less valid composites in the expectation that average performance level will increase. Qualification cut-scores on

existing composites are also routinely revised with similar expectations: to raise the average performance level or to increase the rating size. One shortcoming of this approach is its failure to address the effect of composite changes in one school on student availability and subsequent talent composition of the remaining Navy schools. SYMONAC is intended to examine the simultaneous effect of classification changes on all schools and would enable solutions that provide global optimization across ratings. Optimization through systems modeling is expected to provide beneficial solutions to other Navy selection and classification issues.

SYMONAC is intended for use in planning and optimization. For use in planning, one of the model's features would be altered to see how the Navy selection and classification system would react if it were altered in the same way. For example, the cut-score(s) on one or more school selector composites could be altered to study the effect on school size, attrition, and performance. This modeling approach would allow the effect to be studied on the system level (for all Navy schools), rather than for just one or two schools in particular. For use in optimization, the model could be used to determine values of certain accession/classification parameters that optimize system efficiency. The determination of optimal school selector composites and

cut-scores for each Navy rating provides one example.

Current work involves an analysis of the Navy accession and classification system and the development of a SYMONAC prototype. To achieve this goal, alternative approaches to systems modeling and their applicability to modeling the Navy accession and classification system must be assessed.

Future research will involve the development of a more detailed model which will have a wide variety of applications. These include, but are not necessarily limited to: (1) determining optimal composite composition for each rating; (2) determining optimal cut-scores on composites for each rating; (3) predicting the effect of biographical screening instruments (e.g., Armed Services Applicant Profile (ASAP)) on school performance and attrition; (4) predicting the effect of applicant pool size on average school performance, attrition, and school sizes; (5) predicting the effect of incorporating new predictors into the ASVAB; (6) predicting the effect of increased precision resulting from the use of CAT-ASVAB; and (7) predicting the effects of reduction-in-force resulting from reduced accession goals.

Program Element: 0602233N

Job Performance Measurement (JPM) Program



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Other objectives include the validation of new predictor tests against job performance and the development of a prototype JPM database. The use of new predictors will improve the match between the person and the job, thereby enhancing job performance. A database that includes performance measurement and prediction information will be useful to operational as well as research communities.

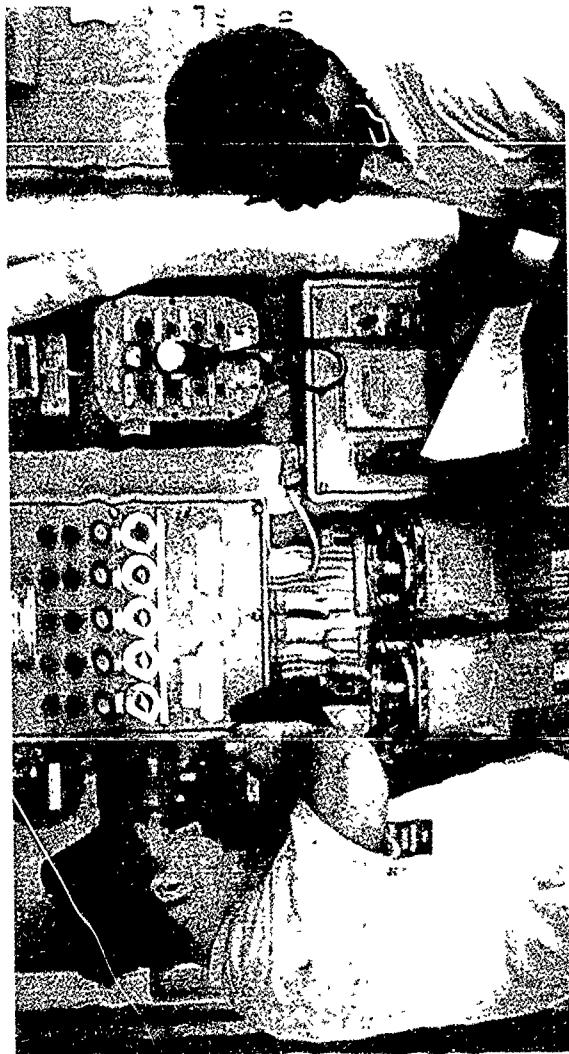
In the primary project of the JPM Program, Performance-based Personnel Classification, various performance measures were developed with an emphasis on assessing technical proficiency using hands-on tests. Field-test packages also included more economical measures of proficiency such as job-sample simulations and behaviorally anchored rating scales.

The effectiveness of the personnel system and, ultimately, performance in the fleet is greatly influenced by personnel selection. Although, on-the-job performance is the most appropriate criterion for validating predictors used during selection, enlistment standards typically are related to the more easily obtained criterion of end-of-course grade. The Job Performance Measurement (JPM) program is part of a coordinated joint-service effort to investigate different performance measurement approaches and to meet a Congressional mandate to link enlistment standards directly to job performance.

It is generally recognized that hands-on tests yield the best performance information, but they are too expensive to administer on a routine basis. One of the objectives of the JPM Program is to develop economical substitute measures for hands-on tests, which are needed to conduct periodic performance measurement.

scales. Fleet data collection also supports two other projects in which new computerized ability tests are fielded and a prototype JPM database is constructed.

To build job samples, critical tasks were selected for the following ratings: Machinist's Mate, Radioman, Electronics Technician, Fire Controlman, and Electrician's Mate. Field test packages consisting of hands-on tests and substitute measures were constructed and administered in the fleet. An Air Force field test package concerning jet engine mechanics was adapted for a technology transfer study. As an in-house study, a field test package for the Gas Turbine Technician also was assembled using previously developed machinist and jet engine mechanic test items.



Data collection, which includes the current administration of a new predictor battery, has been completed for all ratings except the Electrician's Mate and Gas Turbine Technician. Results are reported each year in an annual report to Congress on the progress of the Joint-Service JPM Project.

A Life Cycle Automation Management Plan for a JPM database was completed along with a needs assessment and functional requirements analysis. Based on these results, a prototype JPM database was constructed.

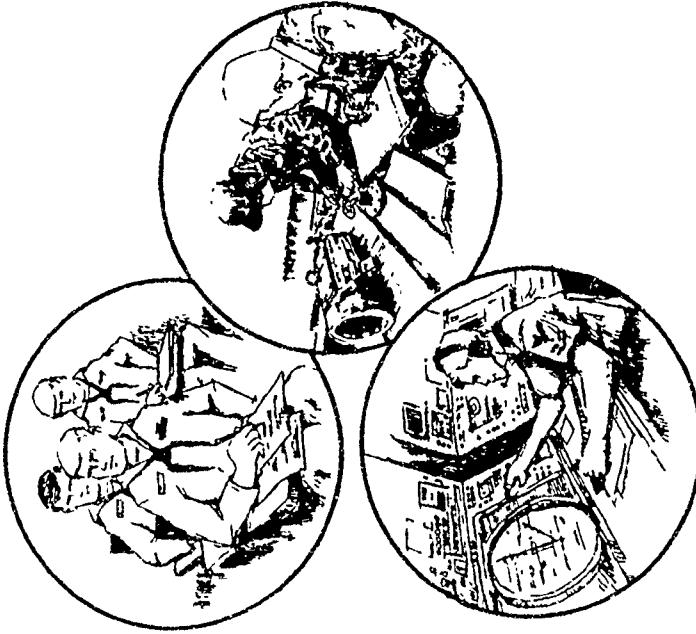
In the future, data collection will be completed for the two remaining ratings, bringing the project to an end. The relationships between scores on the Armed Services Vocational Aptitude Battery (ASVAB) and the performance tests will be prepared for incorporation into the Navy's automated classification system, Classification and Assignment within PRIDE (CLASP). The relationships will also be passed along to a new project to develop a cost/performance trade-off model for setting enlistment standards. Finally, the JPM database will be taken to operational commands to demonstrate its potential as a training assessment tool.

Program Element: 0603707N

Publications

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The Job Performance Measurement (JPM) Program assesses technical proficiency, in the fleet, using field test packages, which include hands-on tests, paper-and-pencil tests, and computer-based job samples.

Classification and Assignment Within PRIDE (CLASP) System Development



Since 1981, the Navy has used an automated classification system to assign non-prior service male and female applicants to entry-level Navy jobs. The system yields a list of potential assignments ordered on the basis of person-job match quality. A recruit applicant is encouraged to accept the top job on the list so that Navy objectives and, to a lesser extent, personal objectives are maximally satisfied.

Actual assignments are often the result of a compromise between classifier and applicant. Assignments at or near the top of the classifier's list of available jobs are clearly in the Navy's best interests. The applicant has not completed the enlistment procedure (e.g., joined the Navy) during classification and, as a result, he or she may bargain effectively for a desired assignment near the bottom of the list at the Navy's expense.

This project reviews the enlistment transactions, analyzes the performance of the

Classification and Assignment within PRIDE (CLASP) assignment procedure under the constraints of the operating conditions, and prepares updated model parameter values. Revised parameter values are needed to ensure that the model is able to meet changing personnel quality requirements or changing personnel quality levels.

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A secondary goal of the project involves exploring opportunities to extend the model's decision base by including job performance information. At present, classification is heavily influenced by dependence on aptitude information.

When the model was first designed, the intention was to use a variety of psychological input variables so that a classification decision could be based on a number of diverse data elements. Since it is modular in design, the model can accommodate additional components reflecting the value of particular person-job assignments from perspectives other than those currently used.

For maximum benefit to the Navy, a new component that includes job performance information must be designed so that it exhibits interaction between person attributes and job properties. The component will reflect the following Navy managerial requirements:

- (1) the utility of a higher performing person always exceeds that of a lower performer when both are considered for the same job, (2) the utility of a high performer increases as the

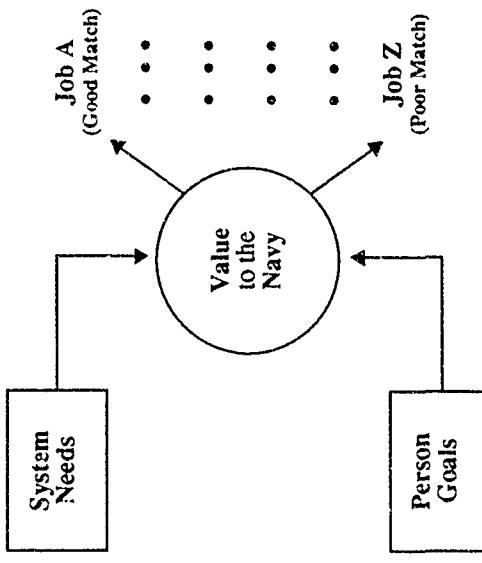
criticality level of the job increases, and (3) the variance of the optimal indices and person-job match quality for a job at the high end of the criticality scale exceeds the variance at the low end.

Program Element: Reimbursable

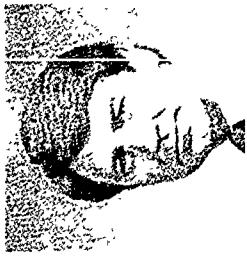
Publications

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Person-job Match



Personnel Quality Requirements (PQR) Project



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examining alternative enlistment standards. These models will be combined into a PQR system that will be used to establish personnel quality requirements, determine recruiting goals, set enlistment and classification standards, conduct a variety of trade-off analyses, and evaluate the potential effects of changes in requirements or standards.

To access and maintain a high quality force, the Navy must set enlistment standards that will yield the appropriate mix of personnel capabilities required to meet its mission. Because Congress has expressed concern about the relationships among enlistment standards, recruit quality, and on-the-job performance; the personnel quality requirements that underlie enlistment standards must be related to expected job performance. The general goal of the Personnel Quality Requirements (PQR) project is to develop a system for setting and evaluating alternative enlistment standards, as well as for determining and justifying quality requirements.

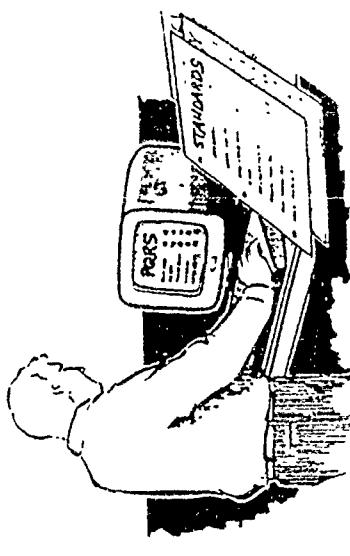
The core of the PQR system will be the trade-off model that will allow recruit quality requirements to be examined in the following ways: (1) Given a required performance level, the model will solve for the minimum recruiting/training budget necessary to achieve that level and the optimum enlistment standards required to achieve the required performance at the lowest cost. (2) Given a recruiting/training budget level, the model will solve for the maximum performance that can be achieved and the enlistment standards necessary to achieve that performance at the lowest cost. (3) Given a quality distribution of recruits, the model will estimate the performance level that can be expected and the recruiting/training budget required to obtain that recruit quality distribution.

The specific objectives of the PQR project are to develop models for: (1) relating personnel quality to expected job performance; (2) conducting trade-off analyses among recruit quality, job performance, and personnel costs; and (3) simulating the Navy's automated classification system (Classification and Assignment within PRIDE or CLASP) and

quality distributions (by ratings) for a given input distribution of recruit quality derived from the trade-off model. In this way, the impact of specific changes in recruit quality requirements can be evaluated for those jobs that would be effected during an ideal assignment of a recruit cohort by the CLASP system simulation.

The approach of the project involves the orderly development of the core trade-off model, which will be increased progressively in precision and complexity. A rapid prototyping of the cost/performance trade-off model will be completed using available data. The prototype model will be refined, the CLASP simulation will be programmed, and an evaluation capability will be developed.

Program Element: 0605152N



The system will also include the capability to evaluate the effects of changes in quality requirements and associated enlistment standards on the recruit quality distributions and the expected performance levels for all of the jobs included in the Navy's classification system. A simulation of the CLASP system will be programmed to provide an output of

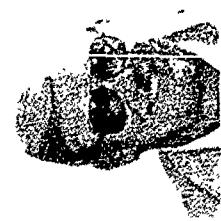
Education and Training

Function and Product Line Descriptions

Develops training technologies to enhance personnel readiness. Employs existing and emerging technologies in the development and application of training systems to alleviate training problems and improve the Navy and Marine Corps' operational readiness.

- **Operational Training** ↳ Develops training programs to support specific operational weapons systems including enhancements to existing programs and application of emerging training technologies to these systems.
- **Schoolhouse Training** ↳ Develops content specific instructional materials and processes designed to enhance the effectiveness and lessen the cost of the delivery of formal Navy schoolhouse instruction.
- **Curriculum Acquisition, Development, and Revision** ↳ Develops, tests, and evaluates systems designed to support the development of curriculum materials. These include automated systems designed to support instructor delivered training materials and systems for computer delivered training materials.
- **Neurosciences** ↳ Develops and evaluates technologies to assess and enhance performance and training procedures using neuroscience, neural network, and behavioral approaches. Performs research and development for improved assessment of human capabilities, including sensory and cognitive processing, skill development and retention, real-time monitoring, and on-the-job performance prediction.

Artificial Intelligence Explosive Ordnance Disposal (AI-EOD)



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human factors engineering expertise and project management.

The AI-EOD project provides EOD technicians of all services with an effective, easy-to-use information system for identifying ordnance and retrieving the appropriate "render-safe" procedures. This information system is necessary to increase the accuracy and efficiency of EOD technicians as the size and complexity of the EOD mission increases. The existing microfiche-based information system is difficult and confusing to use in the field and in training. This system is frequently cited as a cause of school attrition and setbacks and, more importantly, as the cause of reduced performance in the field. The technical goal of the AI-EOD project is to demonstrate the effectiveness of an improved information system by increasing the efficiency of EOD teams.

The Office of the Secretary of Defense, via the Joint-Services Manpower and Training Systems Development Program, issued a requirement to convert the Explosive Ordnance Disposal (EOD) database to electronic format. This effort would use artificial intelligence (AI) to develop an information system, which would be tested and evaluated using operational personnel. The EOD community expressed a similar interest in "computerizing" the EOD database and using existing technology to automate the storage, retrieval, updating, reproduction, and utilization of technical information.

The design and development of the AI-EOD delivery system was completed through the combined efforts of the personnel of the Joint-Services with the Navy Explosive Ordnance Disposal Technology Center (NEODTC) providing subject-matter expertise, the Los Alamos National Laboratory providing the AI/computer design/development expertise, and the NRPDC providing

technicians at 20 operational sites from the four services.

Phase I efforts resulted in "AI-EOD System Requirements Analysis," "Technology Assessment for AI-EOD," and "AI-EOD Configuration Management." Phase II documentation is in progress and a fact sheet identifying the features and benefits of AI-EOD was produced. Phase III will result in a final report on the AI-EOD system and the results of the test and evaluation.

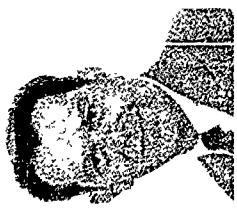
Program Element: 060472S

Features	Benefits
Universal Windows	Consistent, intuitive graphical user interface (GUI) Short learning curve Can conduct parallel searches across the same document or different documents Portable Complies with DoD standards
Artificial Intelligence	Modified after actual neurobiological processes Can teach conclusions based on incomplete or inaccurate as well as negative data Suitable for other platforms (e.g., DOS/Windows) as well as other applications Represents an innovative implementation of AI technology Evaluates and rates the publications, and places the publications with the best fit at the top of the list Combines phonetic and "fuzzy" searches Displays and updates a list of relevant publications in real time
Image and Text Management	Viewing features include multiple windows, zoom-in and -out, rotate, and scroll Select one or more publications for printing on a laser printer Records searches as a type of audit trail

"Fuzzy Search"–An instant search for data that finds answers that come close to the drafted data. Fuzzy searches can get results when the exact spelling is not known, and they can help users obtain information that is loosely related to a topic.

The delivery system will be validated at the NEODTC. Data are being gathered at the Navy School for Explosive Ordnance Disposal (NAVSOC/EOD) to establish "expert" and "novice" performance base lines. Data will then be gathered from journeymen EOD

Propulsion Engineering Simulator Trainer: STEAMER II



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The STEAMER II project is a research effort designed to transition and evaluate an application of artificial intelligence (AI) technology in military training. While project antecedents addressed a host of issues ranging from AI hardware and software development to investigating how people learn and understand complex systems, the current effort involves design and development issues relating to fielding a computer-based system that can provide training and assist with skills maintenance for Naval Reserve marine propulsion engineering personnel. The goal of the project is not only to field a training system based on a high fidelity simulation model of a marine steam plant, but also to provide a set of software tools to allow training developers to construct and implement new dynamic simulations and tutorials. Development of the STEAMER II system will provide the experience required to implement low-cost, model-based simulation/training applications for other marine propulsion engineering systems.

STEAMER II consists of a graphical interface that is linked to the same mathematical model that drives the 19E22 steam plant simulator at the Surface Warfare Officer School (SWOS), Newport, RI. STEAMER II will allow users to observe and manipulate the model at different hierarchical levels. The training system is also being designed so that it can be used in a variety of ways. For example, an instructor can use STEAMER II to demonstrate plant operations or the effects of imposed system casualties. STEAMER II can be used alone or in a network of up to three computers to conduct watchstander engineering casualty control exercises. Plant evolutions are observed on a color display (cathode-ray tube or projected video graphics) depicting various "views" of system components and subsystems. These dynamic views into plant operations are constructed using icons to represent valves, pumps, pipes, gauges, motors, and other components and indicators. Using the system enables the instructor to switch rapidly between different locations, change the state of the plant, or repeat plant actions and responses to allow the student to observe cause and effect relationships. The graphical displays also permit the student to manipulate and observe system representations that approximate a model that experts use to understand and reason about plant operations.

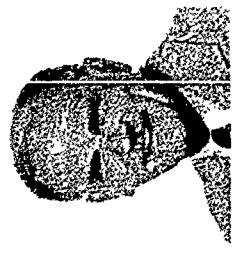
The current effort is directed at installing STEAMER II at several Naval Reserve training sites and facilitating formal testing of the system in its several training modes. As on-and off-line materials are expanded to accommodate greater portions of the existing steam propulsion engineering curriculum, opportunities for more widespread applications within other Navy schools and curricula, including the gas turbine propulsion system, will become increasingly available.

Program Element: Reimbursable

to construct views of the propulsion system and to tie the view components to variables in the mathematical model so that the state of the system is dynamically represented in the view. In using this software tool, the SME chooses component icons (e.g., dials, various types of pumps and valves, pipes) from a menu and positions them on a grid on the color display. This makes it possible to construct views of the propulsion system, which contain the components necessary to portray a specific aspect or principle of plant operations and to allow students to observe various subsystems operating under control of the model. Most important, the editor and graphical approach allows system users to increase the number of views, modify existing views, and extend the training approach to other domains where high fidelity simulation models are available. A gas turbine application, based on the 20H6B, is currently being investigated.

The system is designed to be easily extended and modified through the use of a graphics editor. This editor provides a mechanism for a subject-matter expert (SME)

Marine Corps Training Support



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analysis of two competing range scheduling systems--the Range Facilities Management Support System (RFMSS) and the Land Use Management System (LUMS)--was also delivered. This analysis was well received by the Training Resources group at MCCDC. A recent study assessed existing procedures for evaluating Marine Corps formal schools. This effort addressed how best to "close the loop" between Marine field units, formal schools, and MCCDC. NPRDC surveyed formal Marine schools and field units at western locations, while a contractor surveyed eastern Marine schools and field units. The outcome of this work was a report providing the requirements for standardizing Marine Corps training evaluation and feedback. NPRDC is now involved in further implementation of the Marine Corps training evaluation system.

One of NPRDC's development research efforts has been in support of Marine Corps readiness. The goal of the Training Support Project is to execute the Marine Corps systems approach to training (SAT). This process includes establishing individual training and mission performance standards, planning a curriculum to support these standards, designing training courses, and conducting internal review of training and external evaluation or feedback from the Fleet Marine Forces on the adequacy of the training.

analysis of high risk skills to selected Marine Corps personnel, and the establishment of standards for officer occupational fields 5700 (NBC) and 5900 (electronics maintenance). Presently, individual training standards have been established for more than 80 percent of the Marine Corps MOSSs and further preparation of standards is continuing.

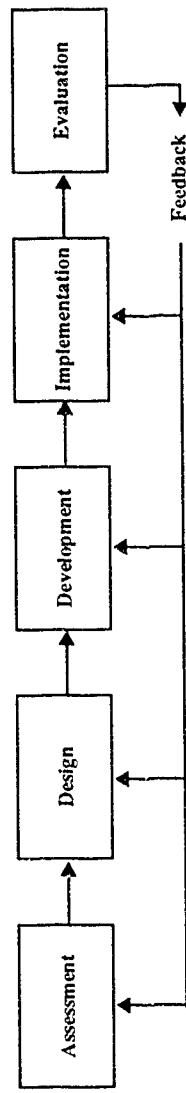
Program Element: Reimbursable

Publications

Lang, G. D., Allen, M. E., McCann, P. H., & Chadbourn, J. G. (1991). *USMC training evaluation and feedback requirements report*. (NPRDC TN-91-15). San Diego: Navy Personnel Research and Development Center.

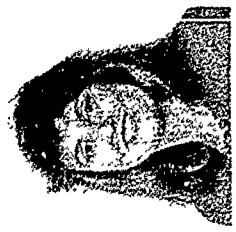
Jenkins, G. L., Anastasi, G. M., & Higgins, J. L. (1991). *Cost/benefits analysis of Marine Corps range scheduling systems*. (NPRDC TN-91-91-14). San Diego: Navy Personnel Research and Development Center.

The Systems Approach to Training



Our sponsor, the Marine Corps Combat Development Command (MCCDC) at Quantico, Virginia, has enlisted the expertise of NPRDC for several years in overseeing their implementation of the SAT process. The work for the Marine Corps is being accomplished through a combination of NPRDC and contract resources. Products delivered to MCCDC include courseware for the small arms gunnery military occupational specialties (MOSSs). These MOSSs were particularly relevant to the Marine mission in the Gulf War. A cost-benefit

Career Systems Design (CSYD)



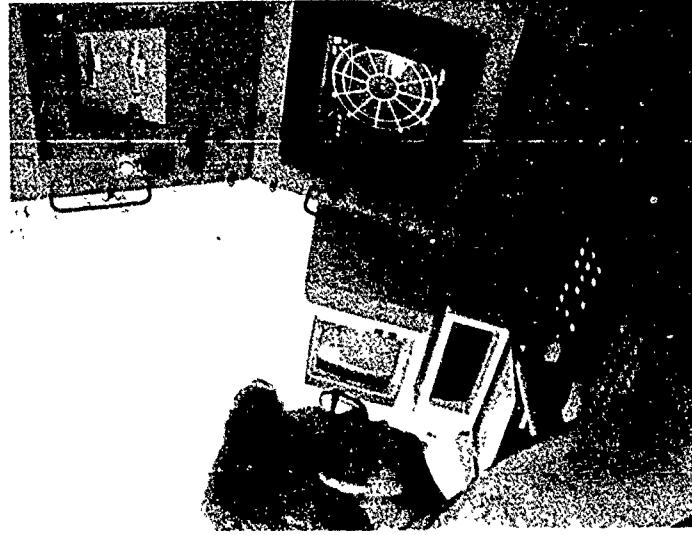
April Moranville
(619) 553-7687

personnel training. The purpose of the Career Systems Design (CSYD) project is to provide a rating continuum training design methodology using the Operations Specialist (OS) and Electronic Warfare Technician (EW) ratings as the design vehicles.

In 1983, an Inspector General (IG) review identified several areas in Navy training that required improvement. Specifically, the review determined that there was no systematic plan for distributing training across an individual's Navy career. Subsequently, the Navy Training Strategy, published in 1985, directed that a training continuum approach be used for development of training. A rating training continuum is defined as a training path that includes all skill and knowledge requirements for a designated rating and identifies the appropriate career points for administration of that training. It extends from the completion of recruit training through all potential rating-related billets and includes formal classroom and on-board training. NPRODC was tasked to utilize the training continuum approach to develop a methodology for Navy enlisted

expected to produce cost savings through efficient and effective training and enhanced professional development.

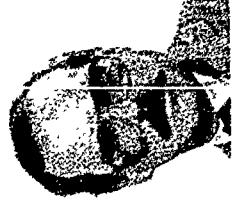
Program Element: 0603720N



The CSYD approach includes developing the rating continuum development methodology, conducting workshops for fleet subject matter-experts (SMEs) inputs, producing continuum training plans (CTPs), conducting fleet reviews of the CTPs, providing assistance for the CTP implementation, evaluating the CTPs, and revising the CTPs where necessary.

Completed products include a training continuum design methodology, OS and EW rating training continuum development workshops, a rating training continuum development workbook, OS and EW technology bases, OS and EW CTPs, fleet reviews of the CTPs, a rating training continuum implementation plan, and a rating training evaluation plan. The effort is providing a cohesive and comprehensive approach for training across a person's entire Navy career; promotes interaction and communication between Navy management, training communities, and the fleet; and is

Electronic Countermeasures (ECM) and Electronic Counter-countermeasures (ECCM) Training



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Pacific and Atlantic (FCTCPAC and FCTCLANT) in 1986. The MPTS used off-the-shelf sophisticated microcomputers. The original systems consisted of a Zenith Z-151 computer with a Tecmar graphics board, high resolution color monitor, videodisc player, black-and-white video monitor, and headphones. The Computer-based Instruction (CBI) Authoring Tools System (CATS) was developed for authoring and presenting lessons. Courseware created by CATS can be presented on different computers, frequently without recompiling the lessons.

Control of the electronic spectrum has been a primary concern of U.S. naval forces for several decades. Interference with a ship's ability to receive and correctly interpret radar signals, known as Electronic Countermeasures (ECM), can significantly diminish its role in tactical operations. Being able to immediately counter this interference, or jamming, known as Electronic Counter-countermeasures (ECCM), can help maintain the ship's operational capability. Because ships must fulfill their mission despite ECM, the Navy needs ongoing ECM/ECCM training for its radar operators. Embedded trainers and simulators, which are first-line solutions to this problem, are expensive at train only a few students at a time. A research effort was initiated in 1984 to examine the feasibility of developing a low cost computer-based training system. This research produced the Microprocessor-based Training System (MPTS), which was first installed at Fleet ComInt Training Center

to 20 students, with new classes convening several times each month. The students are generally Operations Specialists (OSs) Electronic Warfare (EW), and Fire Control (FC) technicians who are attending the class either for refresher training or as new students.

Other software developed through the ECM/ECCM project include: (1) a Chaff Employment Trainer (CET) to help personnel visualize the tactical environment around their own ship and to demonstrate deploying chaff and torch decoys against incoming antiship missiles and (2) a software-driven radar simulation package that will allow lesson authors to develop specific scenarios using the 12 jamming types.

FCTCPAC in San Diego, CA and FCTCLANT in Dam Neck, VA were the first training sites to receive the MPTSs and lessons. The courseware covers all 12 types of ECM and consists of ECM (jamming) recognition and ECCM (counter-jamming) techniques. The ECM lesson teaches students to recognize when their radar is being jammed and to identify the type of interference that is being used. The ECM lesson is generic in nature and does not discriminate among different radar sets. Current ECCM lessons teach specific counter-jamming techniques for the following six different radars: AN/SPS-10, AN/SPS-40, AN/SPS-48, AN/SPS-49, AN/SPS-55, and AN/SPS-67.

Four of the five training facilities worldwide that provide this training currently use the MPTS with its lessons. The fifth expects delivery shortly. Each site holds classes for up

to 20 students, with new classes convening several times each month. The students are generally Operations Specialists (OSs) Electronic Warfare (EW), and Fire Control (FC) technicians who are attending the class either for refresher training or as new students.

Program Element: Rembursable

Over the Horizon (OTH) Warfare Training



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"I think (Saddam) was more concerned about an amphibious assault than he was about allied forces breaching two well-defended land barriers." (Maj. Gen. Mike Myatt, 1st Marine Division, April 2, 1991)

Marines who sat over the horizon from occupied Saudi Arabia during Desert Storm were an example of psychological operations and deceptions used successfully to defeat Iraq. That is the new face of war. During World War II, U.S. Navy and Marine Corps amphibious assaults came directly from 4,000 yards out at sea and then battled their way ashore, sometimes with heavy casualties. Since World War II, detection systems and weapons have improved; it is easier to defend beaches and consequently, the Marine Corps has gotten much better about fighting wars.

In March 1989, Fleet Marine Field Manual (FMFM-1) provided the Marine Corps with a new warfighting doctrine. Although Marine Corps war doctrine has been formed and molded successfully for many decades, the

doctrine as defined in FMFM-1 represents a significant discontinuity with the past. In general, FMFM-1 provides the guidance to enable the Marine Corps to accomplish its military objectives. In particular, FMFM-1 identifies the theoretical elements of war (with all of its uncertainties), the fundamental components of war (fire power and movement), the philosophy of war (maneuver warfare), and the organizational structure (Marine Air-Ground Group Task Force or MAGTF) to merge the theory, components, and philosophy. A major ingredient of this new doctrine is called Over the Horizon (OTH) warfare, which means, among other things, starting the amphibious assault from much further at sea—from 25 to 50 miles. OTH provides two fundamental advantages:

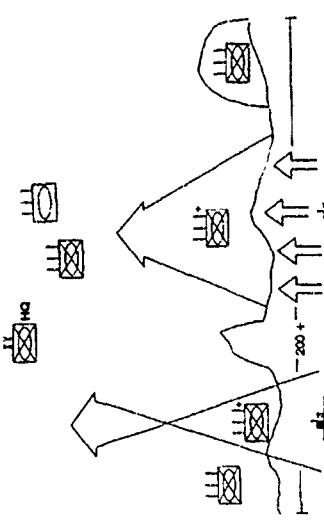
protection from missiles and the element of surprise. In consequence, this OTH capability conveys substantial training implications that need to be resolved in order to ensure successful OTH warfare operations.

NPRDC was tasked to identify Marine Corps training requirements, training technologies, and training test sites for both OTH and Maneuver Warfare (MW). Visits to Marine Corps training and education centers were made to learn about current amphibious warfare education and training and its operational evolution.

Marine Corps Campaign Plan (MCCP), the Marine Corps Long Range Plan (MLRP), and the MAGTF Master Plan (MMP). The MMP identified 49 capabilities, 9 of which are related to OTH/MW training. In addition, 24 OTH/MW topics related to training or education were identified in the MLRP and the MCCP. These 24 topics were grouped into 5 major categories of training requirements. Other findings derived from USMC courses, Marine Expeditionary Unit Special Operations Capable exercises, and OTH Survey results are contributing to a growing database of training innovations.

Several operational, planned, and conceptual computer warfighting simulation systems will be examined to assess their potential for OTH/MW training. In addition, a decision model will be constructed to support this training effort and training technologies will be developed to support Marine Corps prioritized issues.

Program Element: 0602131M



In addition to interviews at Marine schools, selected military and Marine Corps documents were reviewed to provide a foundation for the project including: the

Communication Networks in Training



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could be mastered quickly by instructors. A preliminary cost analysis indicated that conducting training with such a VTT system was more costly than sending an instructor to a remote site but that VTT could be less costly than having students travel to the instructor.

A VTT field survey was conducted during 1990. The survey covered 13 sites in public education, industry, and the military which are currently using some form of VTT to deliver instruction. The survey gathered information on how VTT technology was being employed by its most experienced users. Key findings were that most existing training networks use 1-way video with 2-way audio, VTT systems are expanding into consortia, and many VTT systems have audio problems.

Navy personnel require quality training even when located away from training centers. This project's objective is to find the most cost-effective methods to train students at remote sites (e.g., shipboard, reserve centers, homeports, and other remote locations). During the past 2 years, work has focused on videotraining (VTT) technology in the West Coast VTT demonstration project, VTT field survey, and currently in a VTT laboratory at the Fleet Training Center (FTC), San Diego.

The West Coast VTT demonstration project was conducted during 1989. The project team designed, developed, and evaluated an experimental two-point VTT system consisting of two classrooms equipped with audio and video equipment and communication links to enable two-way communication between the classrooms located at Fleet Combat Training Center, Pacific and Naval Technical Training Center, Treasure Island. The system was used to deliver several courses. Research findings were that VTT was effective for training, accepted by users, and

instructor attitudes suffer in 1-way audio and audiographic conditions.

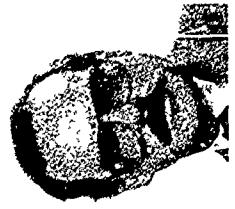
Future laboratory work will develop methods to deliver VTT instruction with hands-on courses, refine VTT instructional methods and strategies, and develop guidelines for designing VTT classrooms.

Program Element: 06022333N

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Surface Combat Operator Training (SURCOT)



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Because of the nature of the work, the skills necessary to contribute rapidly and accurately to own-ship and battle group defense are apt to deteriorate quickly. The Surface Combat Operator Training (SURCOT) project is investigating methods of maintaining and increasing these skills, including:

Probabilistic Data: Vessels from fishing boats to hostile warplanes to anti-ship missiles carry and use a vast number of emitters.

Because of this array of electronic noise, modern equipment frequently does not have enough processing space to cover all operating modes for all emitters. As a result, the emitter identification is not always complete or accurate: Human operators must correctly recognize an incoming missile and take the appropriate action. SURCOT is investigating the relationship of probabilistic data to human information processing in order to train operators to cope with these data.

The U.S. Navy has been accelerating the use of high technology weapons for several decades. As more of the equipment aboard ship becomes computerized, the skill and knowledge of the human operators, such as Electronic Warfare (EW) Technicians, has become more narrowly defined and specialized. The ability of a ship to mount an adequate defense against equally sophisticated weapons systems or to contribute to battle group defense, frequently falls upon EWs in the Combat Information Center (CIC) of a ship. CIC personnel use a variety of passive detection equipment to analyze signals from thousands of potentially hostile electronic systems. EWs must identify these electronic emitters and advise the Tactical Action Officer (TAO) of any threats in enough time to take defensive action. This requires extensive knowledge of possible hostile as well as friendly emitters in the area.

about the strategies used by highly skilled operators in hopes of being able to teach these strategies to all operators.

Skill Degradation: After graduating from "A" school, all sailors must spend several months performing various unskilled tasks before participating in the work they were trained to do. For the EWs, this means that the knowledge and skills they spent months acquiring will start to degrade or disappear. Even the skills of more experienced EWs will degrade when not used. SURCOT is investigating methods of providing training to allow EW strikers to maintain and extend their knowledge and skills during periods of non-use.

Work Load: Evidence suggests that when subjective workload increases, work output suffers. In the case of EW, the output is the ability to identify emitters correctly and take appropriate, timely action. When confronted by a myriad of emitters, whether they are familiar or not, some operators experience a surge in subjective workload and their ability to effectively handle them deteriorates. However, some operators have developed workload management techniques that enable them to maintain their work output through these surges. SURCOT is examining the techniques used by these operators, with plans to develop training for other operators to develop the same ability.

Program Element: 060372DN

Skill Enhancement Program (SEP)



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Basic Skills (JOBS) Strand IV curriculum to identify areas requiring improvement that would enhance the ability of marginal personnel to complete electronics oriented technical training. Following the analysis, NPRDC developed a revised curriculum in FY90 that is presently being pilot tested.

The R&D focus for this project is on the application of instructional technologies and the outcomes of research on cognition and instruction as applied to electricity/electronics (E/E) theory instruction. Some cognitive strategies that are being considered for application are motivational/gaming technologies, adaptive strategies, techniques for the accommodation of individual learning styles, augmented feedback, multi-media/mixed media instructional delivery systems, and any additional methods/strategies to augment skill and knowledge acquisition for application in Navy training.

The Chief of Naval Operations joined with the Chief of Naval Education and Training (CNET) in 1989 to develop and adopt a skill enhancement program (SEP) that provides instructional support to Navy personnel throughout their training, which includes recruit training, technical school training, and on-the-job training (including shipboard). The SEP program intends to employ the latest research findings to close gaps in human performance as applied to Navy technical training and contains an R&D component that continually explores new technologies for addressing school performance problems and enhancing the cognitive skills of students in Navy schools.

Initial SEP project work addressed the need to identify deficiencies in selected Navy technical schools that had been chosen to be "model" schools receiving particular attention directed at implementing innovative instructional technologies. In addition, NRPDC conducted an analysis of the Job Oriented

Completed SEP products include: front-end analysis of the EM, FC, BT/MM, and Navy Construction Training Schools; analysis and revision of the JOBS Strand IV electronics curriculum; a motivation workshop for technical training instructors; two chapters for a Navy Education and Training publication on how to establish and manage a model school; and a technical report.

Program Element: 0603720N

Publications

Ellis, J. (in process). *Enhancing productivity in Navy schools: The use of wall posters and computer programs to influence learning*. San Diego: Navy Personnel Research and Development Center.



The approach is to develop adjunctive stand-alone computer-based instruction (CBI) that could be used in a number of Navy E/E oriented "A" schools. The instructional goals are to give students a qualitative understanding of how circuits work and to determine how effective gaming and other motivational strategies are used in enhancing learning, performance, transfer, and retention. The project site is the Avionics "A" School in Millington, TN. The plan is to develop, install, and evaluate these innovative programs over the course of the project.

Paperless Classroom



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The primary Navy curriculum product is the Instructor Guide (IG) as described in DOD-HDBK-292 and MIL-STD 1379. These documents are used by the instructor to guide all aspects of classroom delivery and training. The IG contains a detailed outline of all material to be taught, references to all supporting technical publications and training aids, and plenty of blank lines. These blank lines can be used by the instructor for "personalization," a process whereby the instructor adapts the outline for his own use by adding technical detail, notes on how to explain difficult concepts, contextual information, use of training equipment, and classroom and laboratory management. For most training courses, the IG averages about 200 pages per week of instruction. It is the complete script for many hours of instruction and the "source code" for the knowledge

It has been widely reported in the popular press that modern naval vessels are inundated with paper. Most of this paper results from technical information and documentation required to support operation and maintenance. Major programs, such as Computer-aided Acquisition and Logistics Support (CALS) and the "Paperless Ship" initiative are underway to address the problem.

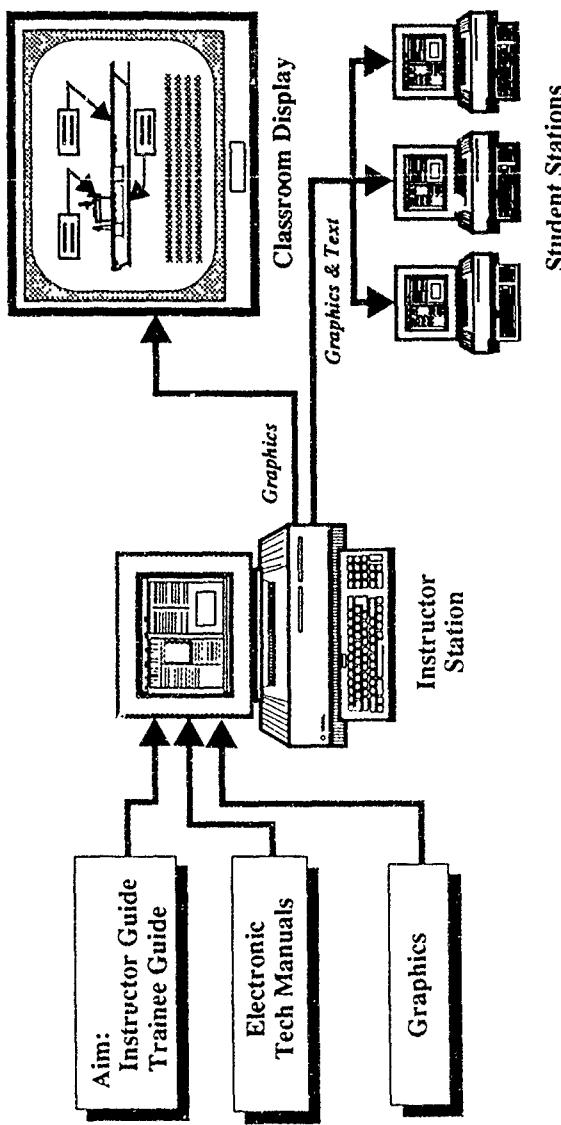
In training, the problem of dealing with extensive technical documentation is as severe. In addition to on-the-job technical documentation, additional publications contain extensive cross-references to technical publications and to other training materials or aids, such as audio-visual presentations and laboratory exercises.

For the past several years, the Authoring Instructional Material (AIM) project has been developing an automated system for curriculum development and maintenance. AIM aids development of paper-based curriculum materials, tracks cross-references to technical documentation, and provides an audit trail for training requirements.

and skills students learn. The next logical step is to develop a paperless version of the IG, together with ways for the instructor to use it.

The AEGIS Training Center has agreed to serve as a test site for this project. They have the AIM system in place and are very interested in helping us explore the development of an electronic form of the IG, develop a set of programs which will permit electronic personalization of the IG by the instructor, and develop an electronic interface which will allow instructor control over electronic versions of the technical manuals, visual aids, and video and computer-graphic information displays, which are cross-referenced in the IG.

Program Element: 0602233N



Advancing the Technology of Text Design (TexDes)



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used in the Navy. The tools and techniques are intended to speed the process of materials preparation and reduce editorial and revision cycles. Texts designed for comprehensibility will improve learning and retention of information and will reduce training time.

A machine-readable lexical network called "WordNet" was developed, evaluated, and modified. The Computerized Comprehensibility System (CCS) was also developed. This system analyzes the surface structure of the input text and examines the interrelations between sentences. It then generates criticism for the writer to use in removing ambiguities, logical errors, and inconsistent terminology from the text.

In recent years, there has been a significant increase in the amount and cost of written documentation. In 1985, the Navy had an estimated 30 million pages of technical manuals and an estimated 500,000 pages are being added or revised each year. Across all services, there are over 130,000 different aviation maintenance manuals alone. Per page development costs are between \$300 and \$900. The Navy printing budget for education and training alone is roughly \$30 million a year. With the growing use of computer-based data storage and retrieval and computer-based training, similar higher costs may be incurred in the generation of on-line textual information. These cost figures make it imperative that written text be designed to be maximally usable. One way to attack this problem is by developing computer-based aids for text designers.

Two additional tasks were evaluated. The first involved experimental work to develop guidelines for devising functional diagrams in technical text. The second was a system to improve text readability by formattting text with spaces inserted at phrase boundaries. This led to faster reading and better comprehension test scores. An empirical test of the phrase-boundary formattting program using Navy personnel is underway. Future work will involve developing guidelines that technical writers can use to produce comprehensible technical manuals.

Program Element: 0602233N

WordNet Window

Word: **research**

Mean Verb Help

Specific kinds of 'research'
investigation, research
=> inquiry
inquiry, research, study
=> problem solving

Specific kinds of 'research'
investigation, research
=> inquiry
=> experiment, superimposition
=> count, counting, enumeration, reckoning, tally
=> detection, detective work, police investigation, sleuthing
=> examination, inspection, scrutiny, probing
=> follow-up
=> spying, undercover work

The objective of this project is to develop various computer-based tools and techniques for designers and writers of textual material

Authoring Instructional Materials (AIM)



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will be seriously affected by continuing budget restrictions. Regardless of funding restrictions, there is a shortage of personnel who are experienced enough to develop or revise courses for the fleet.

The objective of this project is to develop automated systems for the design, development, and production of instructional materials for conventional and computer-delivered courses. The systems are intended to support military instructional development by providing computer-based tools that reduce the time, effort, and expertise needed to produce high-quality instructional materials. Initial attention in this effort has been given to building computer-based tools for developing printed materials (text and graphics) for conventional, group-paced instruction.

The Navy has a continuing need to make the production and revision of instructional materials more efficient and effective. The Navy teaches over 7,000 different courses, which require maintenance and revision. In addition, new equipment and more efficient delivery techniques, like computer-based instruction (CBI), increase development and revision requirements. Currently, the production of 1 hour of instruction requires from 100 to 1,000 hours of effort by highly experienced personnel, at a cost ranging from \$5,000 to \$50,000. As personnel costs increase and technological advances necessitate new, increased, and more sophisticated training, the Navy's ability to meet its instructional material needs

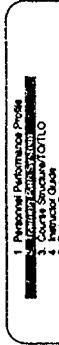
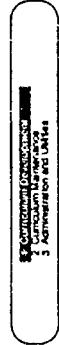
The Chief of Naval Operations has set up an AIM Management Team, tasked with the responsibility of testing, evaluating, and prescribing refinements to the software for transition to Navy-wide implementation. The Navy Training Systems Center, Orlando, has been designated as the AIM Systems Support Office, with the responsibility of supporting AIM once it is implemented.

Program Element: 0603720N

Publications

Vogt, J. L., Robinson, E. R., Taylor, B. E., & Vulfeck, W. H. (1989). *Authoring instructional materials (AIM): Automated curriculum development* (NPRDC-TR-89-12). San Diego: Navy Personnel Research and Development Center.

The AIM curriculum authoring system requires for equipment-based instructional design have been defined. Prototypic computer suites have been purchased and installed at five test sites. The software has been used by Navy educational specialists, contractors, and content matter experts at each of the test sites to produce the complete documentation for a number of courses.



Video Graphics in the Classroom



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visual materials, due to a belief that students may learn some material better from visual media.

The proliferation of video graphic technology and its predicted impact on education and training require that systematic efforts be made to harness this vast and not well charted area. This project has a number of goals:

- (1) Learn from dynamic video media. There is no well defined literature on the psychological aspects of learning from video graphic materials. A paper on current cognitive theory and empirical evidence on how humans store and retrieve dynamic visual information is in progress. While there is a large body of literature on this topic, most of it does not provide guidelines for presenting visual information.
- (2) Evaluate current media selection models. By focusing on current practices within the Navy Surface Training Command in San Diego, we hope to determine how video graphic materials are selected and produced.

Each year, military training organizations spend millions of dollars on audio-visual materials. The materials range from simple aids (e.g., drawings, maps, diagrams, the ubiquitous overhead transparency) to more technical aids (e.g., film, videotape, videodiscs incorporating computer generated graphics and animation). While advanced video graphics presentations may have merit, there are still extensive costs involved in their development and maintenance and learning improvements are difficult to document. Technological advances have made video and graphics easier to develop, but incorporating these elements in ways that enhance the training objectives has been elusive.

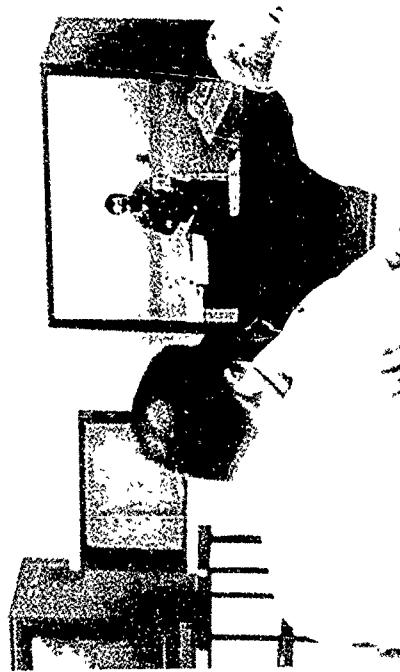
The attractiveness of using video graphic materials is increasing as the technology to produce and use video media becomes less expensive and less complicated. There is also a trend toward supplementing or replacing the traditional emphasis on verbal materials with

Most Training Command, Pacific Fleet facilities returned initial surveys and follow-up interviews have been conducted. The results of this data collection effort have been documented. (3) Develop and evaluate the video workstation. A prototype video development and delivery workstation has been acquired as a companion to another station at the Naval Undersea Warfare Engineering Station (NUWES). We are evaluating the workstation in conjunction with NUWES. (4) Evaluate video in the classroom. We are evaluating the use of video in the classroom in conjunction with the Recruit Training Command, San Diego.

Program Element: 0602233N

Publications

Radke, P. H., & Ulozas, B. (in process). *Choices in media survey results: A survey of how Navy trainers use media*. San Diego: Navy Personnel Research and Development Center.



V.A.V.

Portable Courseware (PORTCO)



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The Department of Defense (DoD) invests millions of dollars to acquire interactive courseware (ICW) training materials and hardware. The hardware hosts a variety of operating and authoring system software. Currently, this variety often means that ICW developed for one system will not function on another. An approach is required to minimize the costs of developing and maintaining ICW materials in the face of rapidly evolving hardware, multiple operating systems, and proprietary authoring software tools.

The goal of this program is to achieve portability for all ICW used in DoD across the entire range of processors, architectures, and peripheral devices, while preserving flexibility and freedom for creativity among developers. We are achieving this goal by establishing ICW standards. When fully established, these standards will allow DoD to make full use of the installed system base for training, regardless of architecture, while maintaining courseware compatibility across all systems.

An approach to courseware portability that maximizes flexibility and compatibility is the specification of virtual device interfaces (VDI) for supporting all basic authoring functions and the creation of rules for extending these specifications to new or exotic functions. Such specifications define a single "virtual machine" environment implemented in software and firmware rather than hardware architecture, provide true device independence, and make it possible to tailor hardware procurements more closely to an organization's specific requirements. Within the virtual device approach, the interface between essential functional requirements of the authoring task and the capabilities of the instructional delivery system is standardized. Each functional requirement is defined in a high level library of commands that are linked to or made part of the authoring system. These commands constitute a common interface between the application courseware (high level virtual device handlers) and the physical system (low level hardware device drivers or callable modules). The interface is defined at the functional level. When these functions are implemented in the form of low-level hardware drivers and appropriate software compilers, all software or courseware written to the functional interface standard will run without modification on any system. Hardware manufacturers will be free to implement functions in their own way.

- The current standard is limited in five significant ways; each leads to planned future work:
1. It provides portability only for MS-DOS courseware and does not address other operating systems. Operating systems portability work is planned.
 2. It is focused primarily on interactive videodisc instruction and does not directly address issues, such as digital audio, that are major concerns in other forms of ICW. Work is planned to extend the current standard to new technology areas.
 3. It provides for systems-level portability, not device-level or "plug and play" portability. Work is planned to extend the

standard practices has been developed and adopted by the Interactive Multimedia Association, with DoD support and encouragement. These practices have been incorporated into Military Standard 1379D, "Military Training Programs" as Appendix D, which is titled *Software Interface and Command Requirements for Interactive Courseware and Authoring Systems*. A DoD Instruction, "Development and Management of Interactive Courseware (ICW) for Military Training" (DoD Instruction 1322.20 of 14 March 1991), requires that all ICW procured by the DoD comply with the technical prescriptions of MIL-STD-1379D.

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 3. It provides for systems-level portability, not device-level or "plug and play" portability. Work is planned to extend the

standard to the level of individual device components.

4. Its graphics provisions are keyed to CGA/EGA/VGA, graphics hardware and firmware and are not amenable to other potential graphics standards. Work is planned to establish a more meaningful and useful graphics standard not based on hardware/firmware.

5. It does not cover the modification of courseware, only its operability. Work is outlined which will lead to some degree of ICW portability among authoring systems.

In addition, plans include the establishment and operation of a facility to verify conformance with the standard interface, the extension of the standard beyond DoD to the Federal Government, and the eventual establishment of an open-architecture multimedia standard.

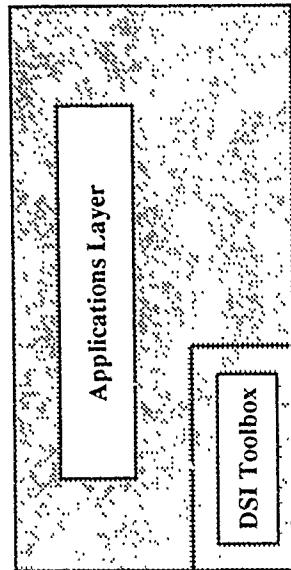
Program Element. 0604722D

Publications

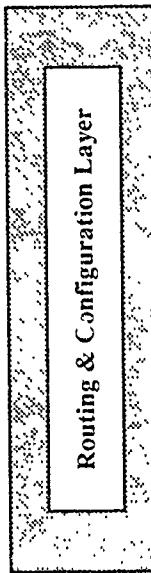
Thomason, B., Van de Wetering, B., & Booth, R. (1990). *A portable courseware architecture* (NPRDC-TN-90-11). San Diego: Navy Personnel Research and Development Center.

Thomason, B., & Van de Wetering, B. (1990). *The MS-DOS device services interface* (NPRDC-TN-90-15). San Diego: Navy Personnel Research and Development Center.

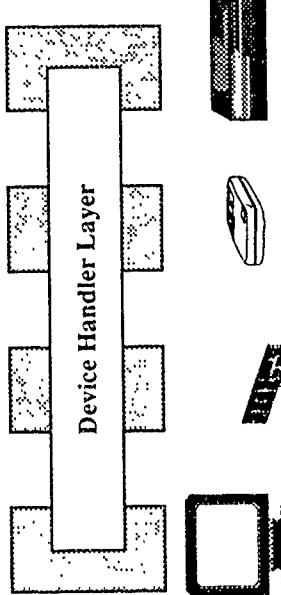
Van de Wetering, B., & Thomason, B. (1990). *The MS-DOS device handler interface* (NPRDC-TN-90-16). San Diego: Navy Personnel Research and Development Center.



Device Services Interface



Device Handler Interface



The prototype PORTCO architecture contains three layers and two interfaces.

Marine Corps Personnel Performance Stability



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Traditional personnel assessment procedures continue to depend heavily on military paper-and-pencil tests. These tests rely primarily on content-based questions that require a correct answer. On-the-job performance depends on adaptability and flexibility of individuals to solve unfamiliar daily problems, which may not require the recall of specific facts tapped by the paper-and-pencil test. NRPDC research, which emphasizes "process" rather than "content" information, shows the potential for improving the prediction of on-the-job performance. Such information would supplement information obtained from the traditional tests.

Advances in the understanding of brain processing have provided methods to more accurately assess individual differences and unique capabilities than methods currently in

use. Neuroelectric and neuromagnetic measures will be used with heart and respiration information to improve the assessment and prediction of behavioral stability. Event-related potential (ERP) neuroelectric measures will be emphasized initially, while the neuromagnetic measures will be developed later. A key research finding has been that low performing individuals show greater brain variability than do higher performing individuals. One of the principal questions this research asks is whether this finding may be extended for use in the assessment of behavioral/performance stability. Emphasis will be on testing security personnel. Psychological, stress, and emotional factors as well as personality, supervisory, and questionnaire data will be measured. Longitudinal follow-on performance data will include disciplinary and attrition data. Specific task-performance data will include M-16 rifle simulator firing scores.

Extensive data, collected during FY90, included several neuroelectric (ERP) data sets, supervisory and self-report ratings, and other questionnaire data covering life stress incidences. Marksman ship scores were predicted from ERP data. The NRPDC neurosciences laboratory has recently implemented new neural network analysis (NN) procedures. Neural network analysis on a sample of 130 Marine Corps personnel provided improved assessment of relationships between ERP and firing range marksmanship performance compared with traditional discriminant

analysis statistical techniques. In addition, NN techniques have shown promise for use in detecting ERP records which may be contaminated with eyeblink artifacts. A marksmanship trainer/simulator was recently integrated into the NRPDC neurosciences laboratory to improve criterion measurement.

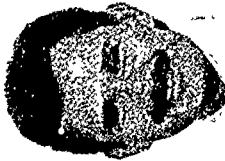
After initial laboratory testing, ERP measures will be adapted for personnel performance stability assessment. These measures will be further developed for field testing with security personnel. The neuromagnetic recording capability also will be developed for improved assessment of personnel performance stability.

Program Element: 0602131M

Publications

- Lewis, G. W., Trejo, L. J., Naioh, P., Blankenship, M. H., & Inlow, M. (1989). Temporal variability of the neuromagnetic evoked field: Implications for human performance assessment. In William, S. J., Hoke, M., Stronk, G., & Kotani, M. (Eds.), *Advances in Biomagnetism* (pp. 217-220). New York: Plenum Press.
- Lewis, G. W., & Sorenson, R. C. (1989). Evoked brain activity and personnel performance. In Dillon, R., & Pellegrino, J. W. (Eds.), *Testing: Theoretical and applied perspectives* (pp. 97-131). New York: Praeger.

Biopsychometric Assessment of Combat Operations



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of performance in experienced operators performing combat system simulations. (ERPs are small electrical waves, which are recorded from electrodes on the scalp. Unlike the electroencephalogram, ERPs are always synchronized with an environmental event, such as a visual or auditory stimulus.) ERP measures include the amplitude and latency of peaks in the ERP waveform and are known to index the quantity of mental resources available for task performance.

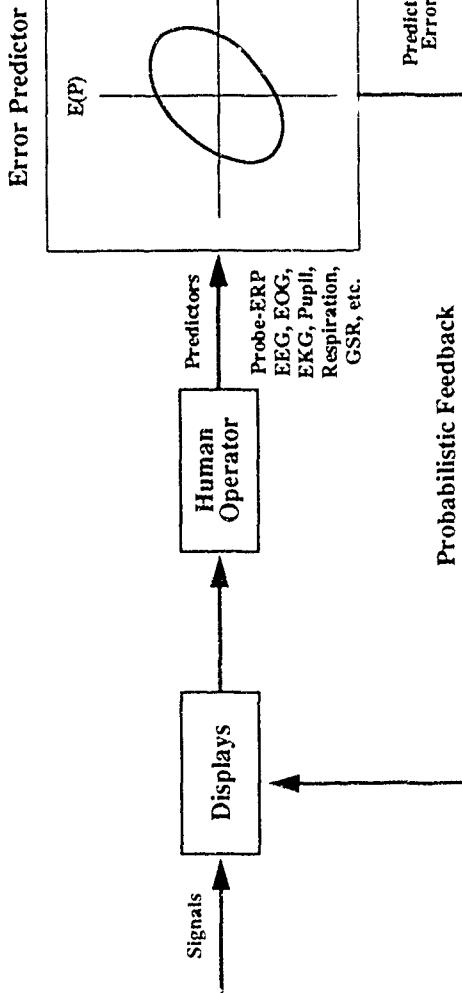
The goal of this project is to determine the feasibility of using physiological measures to monitor and predict the performance of individual combat system operators. The highly technical nature of today's combat systems raises the likelihood of overloading the human operator. For example, human ability is pushed to its limits in the operation of high-performance aircraft, radar and sonar displays, and other complex systems. Some human operators will inevitably experience sensory and cognitive overload, lapses of attention, and performance decrements. Furthermore, the likelihood of such problems increases under stressful conditions or when the operator has a functional impairment (e.g., fatigue, nausea, anxiety, side effects of medication, biochemical imbalance). However, if it were possible to predict performance decrement in an individual, the likelihood of costly human errors could be reduced.

To address this problem, NPLDC uses event-related potentials (ERPs) as predictors

engagement using irrelevant-probe ERP measures. Irrelevant visual stimuli (also called probes) were presented to subjects during a passive baseline period and during active task performance. ERP amplitudes decreased as a function of workload. Absolute baseline ERP amplitudes and workload-related decreases in those amplitudes were correlated with the level of task performance.

In the three subtasks, the objective was to compute instantaneous correlations between ERP measures and task performance. Significant and stable correlations were observed for a 3-second interval. The data showed that these instantaneous correlations depend on three factors: type of processing (perceptual, memory, or computational), probe stimulus relevance (relevant or irrelevant), and workload. These patterns also varied between

Performance Enhancement When Desired Responses Are Unknown



subjects. These results imply that monitoring and prediction of individual performance with ERP data are possible, but will require algorithms that adapt to individuals and tasks.

A separate aspect of this project concerns the test-retest reliability and interlaboratory consistency of ERP measures recorded in perceptual-cognitive tasks. Four independent laboratories performed and analyzed a signal detection experiment (auditory "oddball" paradigm), recording the P300 component of the ERP. The results demonstrated that, although reliability varies somewhat among laboratories, overall reliability is adequate for large-scale testing. For example, at NNRDC, the test-retest reliability for P300 amplitude (25 subjects) was 0.8.

Some effort has also been devoted to improving signal processing techniques, which will improve the correlations that can be obtained between ERPs and performance. Both discriminant analysis and neural networks were used to classify ERPs according to instantaneous workload and performance levels. Depending on task and subject, these methods correctly classify as many as 70 to 90 percent of single trial ERP waveforms.

The work described here shows that ERPs waveforms recorded for probe stimuli, presented during the performance of combat simulations, provide information about the instantaneous performance and workload levels of the operator. Because such probe stimuli are fairly unobtrusive, they can be added to many tasks that require attention to visual displays without degrading task performance. The performance-related information obtained from probe-ERPs could be used to trigger interventions that improve or sustain performance. Such interventions could be as simple as a warning light or buzzer, or as complex as adaptive decision-aiding procedures embedded in the task itself. Future efforts will evaluate ERP predictors in training and experimental simulators and, ultimately, in operational systems.

Program Element: 0602224N

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- Snyder, H. L., & Trejo, L. J. (1990). Research methods. In Widdel, H., & Post, D. (Eds.), *Colour in Electronic Displays* (NATO Technical Report AC/243 (Panel 8) TR/5). Brussels: North Atlantic Treaty Organization. (pp. 85-136).
- Trejo, L. J. (1990). Human performance research at the Navy Personnel Research and Development Center. *Human Factors Society Visual Performance Technical Group Newsletter*, 12, 5-8.
- Trejo, L. J., Lewis, G. W., & Blankenship, M. H. (1990). *Brain activity during tactical decision-making: III. Relationships between probe-evoked potentials, simulation performance, and on-job performance* (NPRDC-TN-90-09). San Diego: Navy Personnel Research and Development Center.
- Trejo, L. J., Inlow, M., Stanny, R. R., Morey, W. A., Makeig, S., Kobus, D. A., & Hillyard, S. A. (1991). *The P300 component of the auditory event-related potential: Interlaboratory consistency and test-retest reliability* (NPRDC-TR-91-6). San Diego: Navy Personnel Research and Development Center.

Organizational Systems

Function and Product Line Descriptions

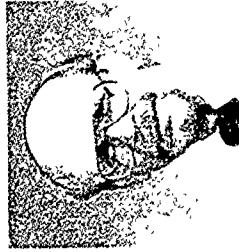
Develops and evaluates performance enhancement and control systems for improving the effectiveness, quality, and productivity of Navy personnel and organizations.

Management Control Systems \Rightarrow Performs needs analyses for the purpose of diagnosing problems with existing systems used for cost, quality, and production control and improvement. Determines appropriate enhancements to such systems and provides models for system development. This frequently includes design, development, and evaluation of management training for quality and productivity improvement.

Incentive Management Systems \Rightarrow Determines feasibility, design, development, test, and evaluation of incentives in Navy organizations. This includes monetary and nonmonetary applications for individual, group, and organization. Nonmonetary types include performance measurement, feedback, goal setting, time off, suggestion systems, employee involvement, and job redesign.

Organizational Systems Evaluation \Rightarrow Includes diagnostics of organizations, their designs, functions, and “climate” or culture. Also includes evaluation of programs that have aimed to change these factors.

Total Quality Leadership (TQL) Training



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productivity. In 1989, the Secretary of the Navy formed a high level Executive Steering Group (ESG) to oversee the "implementation" of TQL throughout the DoN. The ESG is chaired by the Under Secretary of the Navy and its membership includes high ranking shore activity commanders and assistant secretaries.

TQL represents a new approach to management based upon the quality management theory of W. Edwards Deming. The ESG cited two crucial requirements for implementing TQL in the DoN--top down leadership and extensive education and leadership training. The ESG also agreed to adopt an implementation model developed by DPRDC.

Total Quality Leadership (TQL) is defined as the application of quantitative methods and the leading of people to control and improve: (1) materials and services supplied to the organization, (2) the processes resulting in products and services of the organization, and (3) meeting the needs of the end user; now and in the future.

In March 1990, the Department of the Navy (DoN) adopted this definition developed in 1985 by Naval Air Systems Command (NAVAIR) and DPRDC for use throughout all of its activities.

TQL is the Navy's response to Presidential Executive Order 12442, which requires all Federal agencies and departments to improve

(2) basic concepts and principles of total quality; the leadership role, (3) basic methods and tools for process improvement, (4) quality improvement teams, (5) strategic leadership for quality, and (6) implementation of TQL.

The Senior Leaders Seminar is the "flag ship" course for TQL education and training in the DoN. It provides definitions for quality concepts as well as methods and procedures for getting underway with total quality.

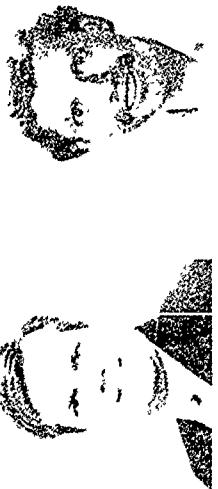
The seminar is directed towards DoN leaders. Other courses will be directed at other groups, such as total quality coordinators. The education and training matrix presented here identifies the people to be trained as well as the courses required. The numbers in the cells represent the order in which the courses should be taken by each group.

Two other course development efforts are underway at DPRDC: Fundamentals of TQL and Basic Methods and Tools. These courses are expected to be completed this year. Others (e.g., Team Concepts, Design of Experiments) will follow in the coming year. As the DoN's TQL efforts expand, other courses will follow as research and development efforts continue in total quality.

The course consists of six modules and includes: (1) need for and benefits of quality,

Program Element: Reimbursable

Team Oriented Performance Management (TOPM)



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old methods, proved not to be the solution to the problem of rating inaccuracy.

Furthermore, others argue that the individual performance appraisal does not sufficiently focus on the organization's goals and may result in individual goals that do not contribute to the mission of the organization. Individual performance goals may also reinforce competition rather than cooperation and reward the individual for setting achievable short-term goals rather than riskier long-term goals.

Though the reasons for a regular appraisal of employee performance are almost always laudable (e.g., goal setting, promotion, employee development, and feedback), managers as well as management theorists question whether annual appraisals can be used in such a comprehensive way. Critics question the accuracy of the annual performance appraisal and the value of a supervisor's subjective rating. As far back as 1957, there has been concern about the utility of appraisal. Since that time, it has been associated with many forms of error (e.g., leniency error, halo error) and bias (e.g., expectation bias, self-serving bias). Attempts to correct these problems led to the development of new forms of rating scales (e.g., forced choice, Behaviorally Anchored Rating Scales). However, these new measurement instruments, while more appropriate than the

performance elements (team process improvement, individual contributions to team work, and the development of process improvement skills) and from at least three different sources (team performance, as reported by the organization's TQL management information system, peer appraisal, and supervisor appraisal). The format for the appraisal rating is presented below.

Appraisal Rating

	Individual	Team Process	Individual	Individual
Performance = Improvement + Contribution + Development to team work Score	Appraisal Score			

NPRDC is developing a performance management system in the context of a total quality organization, Team-oriented Performance Management (TOPM). This system uses cross-functional teams (Executive Steering Committee, Quality Management Boards and Process Action Teams) to develop process measures and provide regular feedback to the whole team on the team's success in process improvement. Also provided is regular feedback from internal and external customers and information concerning the overall goals of the organization.

Five candidate Department of the Navy activities have been nominated as test sites. Of these, one or two will receive assistance from NPRDC in developing and implementing TOPM. Future work includes: (1) a formal assessment to resolve issues impeding successful implementation, (2) the development of structures for action planning, (3) identification of work processes for testing TOPM, (4) restructuring of the activity's performance appraisal system, and (5) transfer of TOPM technology to other Navy activities.

Program Element: Reimbursable

Organizational Systems Evaluation

on its people and determine innovations which will lead to positive outcomes for personnel. In our work, we diagnose organizations (their designs, functions, and organizational climates) and evaluate the effects of organizational change.

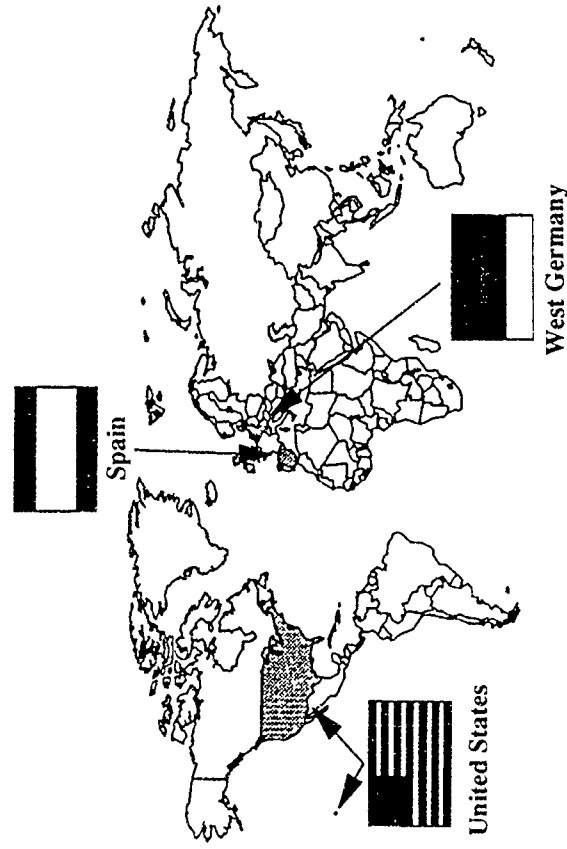


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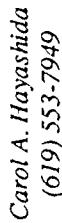
A major effort has been our evaluation of the Experimental Civilian Personnel Office Project (Project EXPO), a 3-year research project exploring ways to improve productivity within the civilian personnel system. Innovations in human resource management were proposed, implemented, and tested by 34 Navy, Army, Air Force, and Defense Logistics

Agency organizations in the United States, Germany, and Spain.

The Office of Personnel Management (OPM) and the Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy (ODASD(CPP)) sponsored this evaluation. NPDFC researchers served as the external evaluators for the project. Benefits of Project EXPO included money savings, improved hiring practices, streamlined documentation procedures, faster response times, an emphasis on attracting and retaining the best employees, and increased managerial and supervisory involvement in selection and



Experimental Civilian Personnel Office Project



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With a reduced Department of Defense (DoD) budget and increasing expectations on the part of the public and Congress that DoD improve the quality and productivity of its efforts, there is an urgent need to evaluate organizational functioning and measure the impact of any improvement efforts. Such evaluations should address not only an organization's effectiveness in terms of outcomes such as productivity and efficiency, but should also assess the effect of an organization

hiring procedures. These benefits have translated into changes in policies and regulations to support more efficient personnel management systems that have been redesigned to attract, acquire, develop, retain, and reward competent people.

Another evaluation underway is that of the Pacer Share Personnel Management Demonstration Project. The Office of Personnel Management (OPM) is sponsoring a joint Air Force/Defense Logistics Agency project to implement and test a more streamlined personnel system and new ways to motivate employees to improve productivity. The test site is within a DOD Directorate of Distribution in Sacramento, CA. Pacer Share was designed to improve productivity by creating a more flexible and responsive personnel system. N PRDC's evaluation of the demonstration project includes a description and evaluation of the site, the implementation effort, and project outcomes. It also compares

the site and project outcomes with sites not involved in testing the innovations.

Other projects include the evaluation of efforts to implement total quality management systems within DoD organizations. Evaluations include the use of questionnaires to assess organizational readiness for the implementation of continuous improvement, to determine the degree to which continuous improvement methods are being used, and to identify facilitators of and impediments to the adoption of this management approach. One 3-year project involves the use of questionnaires, on-site interviews, and the analysis of performance data to assess the adoption of a continuous improvement effort and to determine its effect on the organization and its employees.

The information obtained in these evaluation efforts is being used to develop a model of organizational change. This model will provide an understanding of change efforts that

Program Element: Reimbursable Publications

Sheitel-Neuber, J., Shepoch, J. P., Hayashida, C. A., Arbor, H., Cooke, R., McNulty, W., St. Clair, P. C., & Trusso, P. (in process). *Experimental Civilian Personnel Office Project (EXPo): Final report for non-appropriated fund sites*. San Diego: Navy Personnel Research and Development Center.

Shepoch, J. P., Sheitel-Neuber, J., Arbor, H., Cooke, R., McNulty, W., St. Clair, P. C., & Trusso, P. (in process). *Experimental Civilian Personnel Office Project (EXPo): Final report for appropriated fund sites*. San Diego: Navy Personnel Research and Development Center.

facilitate the successful adoption of innovations.

The results of these evaluations will contribute significantly to organizational change theory as well as to diagnostic and advisory services to organizations undergoing change.

Program Element: Reimbursable

Sheitel-Neuber, J., Shepoch, J. P., Hayashida, C. A., Arbor, H., Cooke, R., McNulty, W., St. Clair, P. C., & Trusso, P. (in process). *Experimental Civilian Personnel Office Project (EXPo): Final report for non-appropriated fund sites*. San Diego: Navy Personnel Research and Development Center.

Shepoch, J. P., Sheitel-Neuber, J., Arbor, H., Cooke, R., McNulty, W., St. Clair, P. C., & Trusso, P. (in process). *Experimental Civilian Personnel Office Project (EXPo): Final report for appropriated fund sites*. San Diego: Navy Personnel Research and Development Center.

On-site Research Applications

Appendix A

Appendix A: On-site Research Applications

Manpower	Project	Implemented Product	Site
	Advancement Interface System (ADIN)	Petty officer advancement planning model	PERS-22, Navy Annex
	Force Analysis Simulation Technique (FAST)	Enlisted inventory projection model	PERS-22, Navy Annex
	Structured Accession Planning System for Officers (STRAP-O)	Officer manpower analyses system	PERS-21
	Officer Personnel Information System (OPIS)	Officer information delivery system (IDS)	PERS-21, PERS-23
	Budget Obligation Analysis Tracking System (BOATS)	Manpower budget execution management system	PERS-332, Washington, DC; Navy Finance Center, Cleveland, OH
	Defense Personnel Analysis Systems (DPAS)	Defense personnel IDS	Office, Assistant Secretary of Defense (FM&P)
	Enlisted Personnel Allocation and Nomination System (EPANS)	EPANS	Enlisted Personnel Management Center, New Orleans, PERS, Washington, DC
	Officer Distribution Management System (ODMS)	Officer distributable projection system (ODROJ)	PERS-45
	Joint Specialty Information Delivery System (JSIDS)	Navy manning plan, officer (NMPO) Officer manning information system (OMIS)	PERS-41, PERS-42, PERS-43, PERS-44, and PERS-45
		Joint specialty officer information system	PERS-2

Manpower (Continued)

Project	Implemented Product	Site
Permanent Change of Station (PCS)/Readiness Impact	PCS moves/unit readiness model	PERS-46, Navy Annex
Sea/Shore Rotation Model (SSRM)	Sea/shore policy evaluation model	PERS-22
Skill Personnel Projection for Enlisted Rotation (SKIPPER)	Enlisted community management projection model	PERS-22, Navy Annex
PCS Moves Forecasting	PCS moves forecasting model	PERS-73, PERS-46
U S Marine Corps (USMC) Enlisted Planning System	Inventory projection model (IPM) Manpower planning model (MPM)	Headquarters Marine Corps (HQMC), MPP-20; HQMC, MPP-20
Officer Assignment Decision Support System (OADS)	Officer assignment	HQMC, MM, MMOA-3
Personnel		
Officer Selection Systems	Maintain/evaluate selection system	U.S. Naval Academy
Navy Occupational Data System (NODAC) Leadership Survey	Design of officer leadership training needs analysis	PERS-62
Experienced-based Learning Training Resources Management	Assessment of NAVOP-105 policy "C" school planning systems	PERS-2
Inspector General (IG) Command Climate Survey	Enlisted training tracking file (TRAINTRACK)	PERS-112, PERS-2, OP-29, PERS-10, Naval Training Systems Center (NTSC), CNTT, Commander, Naval Reserve Force Commander in Chief, Atlantic Fleet
Navy Personnel Survey System	Command climate survey system	PERS, Washington, DC
Annual Navy wide personnel survey		
On-site Research Applications		

Personnel (Continued)

Project	Implemented Product	Site
Civilian Personnel Survey	Computer Enhanced Navy Survey System (CENSUS)	Office of Civilian Personnel Management
Lost Time of Men and Women	Survey of pregnancy and single parents	Chief of Naval Personnel (CNP)
Equal Employment Opportunity (EEO) Enhancement	Racial/ethnic origin survey	Naval Sea Systems Command
Equal opportunity (EO) Survey	Equal opportunity/sexual harassment survey	CNP
Recruiter Information Delivery System (RIDSS)	Recruiting information system	Chief of Naval Recruiting Command (CNRC)
Recruiter Allocation Model (RAM)	Recruiter allocation model	CNRC
 Testing Systems		
Classification and Assignment Within PRIDE (CLASP)	Maintain/evaluate classification and assignment system	PERS-29
 Education and Training		
Career Systems Design	Rating continua design methodology	PERS-111
USMC Individual Training Standards	Development of training standards for over 100 military occupational specialties (MOSSs)	Marine Corps Combat Development Command (MCCDC), Quantico
Map Interpretation and Terrain Association Course (MITAC)	Improvement of helicopter pilot navigation skills	USMC Squadrons

Education and Training (Continued)

Project	Implemented Product	Site
Infantry MITAC	Improved map interpretation for USMC ground combat personnel	Officer Basic School, Quantico; Division Schools, Camps LeJeune and Pendleton
Intelligent Maintenance Training System Steam Propulsion Plant Operator (STEAMER) Electronic Countermeasures and Electronic Counter-countermeasures (ECM/ECCM)	Training of SH-3H, AE, and AD maintenance personnel Training aid in teaching operation of 1200 lb propulsion system Teaching recognition of and response to electronic radar system	Naval Aviation Maintenance Training Group, North Island Surface Warfare Officers School, Coronado Fleet Combat Training Center, Pacific (FCTC-P), Fleet Combat Training Center, Atlantic (FCTC-L)
S-3B Features Recognition Systems (FADS)	Training of personnel to recognize contacts on advanced radar system	VS-27; Fleet Aviation Special Operations Detachment, Cecil Field
S-3B Passive Acoustic Decision System	Training of advanced acoustic decision system	VS-27, VS-41, VP-30, VP-31, Anti-submarine Warfare Training Center, Pacific, Atlantic; Surface Ship Acoustic Analysis Center VFW-110, VFW-120
E-2C Radar Operator Simulation Training H-53 Helicopter Maintenance Simulation	Training of tactical personnel in operation of radar system Computer training system for USMC H-53 maintenance personnel Human-computer interfaces for joint tactical information distribution system (JTIDS) computer models Assist in the development of AEGIS scenario development system (ASDS)	Marine Corps Air Station, El Toro Naval Air Development Center Naval Surface Weapons Center

Education and Training (Continued)

Project	Implemented Product	Site
BATMAN & ROBIN	<p>Support warfare analysis laboratory (WAL)</p> <p>Scenarios for adaptive functional allocation for intelligent cockpits</p> <p>ROBIN front-end expert system to create complex scenarios (TACTIC)</p> <p>Scenario generation for integrated undersea surveillance system (IUSS)</p> <p>Front-end for battle force in-port trainer (BFIT)</p>	Applied Physics Laboratory/ Johns Hopkins University Naval Research Laboratory NTSC
	New user interface for War-game Weapons and Tactical Analysis Center (WEPTAC) war-game; Phase II (WEPTAC II)	Naval Weapons Center
	Support War-gaming Analysis Research (WAR) Laboratory	Naval Postgraduate School, Monterey
	Advanced tactics training for E-2C and E-3A crews	Carrier Airborne Early Warning Weapons School, Naval Air Station (NAS), Miramar
	Advanced Anti-submarine warfare (ASW) and anti-surface warfare tactics P-3C	Commander Patrol Wings, Pacific NAS, Moffett Field
	Interoperability of air and surface platforms for ASW	Sea-based Weapons Advanced Tactic School, NAS, North Island
	Maritime air superiority (MAS) F-14 fleet replacement crews	VF-124, NAS, Miramar
	Skill Enhancement Program	Naval Training Center (NTC), Great Lakes
	EM "A" school	

Education and Training (Continued)

Project	Implemented Product	Site
Low Cost Micro-computer Training Systems (CBESS)	Officer and specialist threat memorization training	Navy and Marine Corps Intelligence Center, Dam Neck
Authoring Instructional Materials	Threat memorization training Tactical action officer threat memorization training	Commander Tactical Wings, Atlantic, NAS, Oceana FCTC-P, San Diego
	Helicopter crew threat recognition training Remedial training job-oriented basic skills (JOBS) Remedial training (SeaBees)	Aviation Research and Development Facility, Ft. Rucker Chief of Naval Technical Training Naval Construction Training Centers, Gulfport and Port Hueneme
	EM "A" school Refresher training	NTC, Great Lakes Chief of Naval Education and Training, Water Front Trailers, Long Beach and Norfolk
	70 weeks of instruction in various fields	Naval Education and Training Support Center (NETSCCPAC), Training Systems Development Department
	Over 500 weeks of instruction in engineering and electrical systems Submarine systems	Service School Command, NTC, Great Lakes Naval Submarine School, New London

Education and Training (Continued)

Project	Implemented Product	Site
Authoring Instructional Materials	TRIDENT engineering, operations, and strategic weapons training materials	TRIDENT Training Facilities, Kings Bay and Bangor
	NAVSEA curricula	Naval Ship Weapons System Engineering Stations, Philadelphia and Port Hueneme
	SSN 21 systems	Newport News Shipbuilding
	Technical training	AEGIS Training Center, Dahlgren
Artificial Intelligence (AI) Tools in Authoring	Computerized front-end analysis tools	NETSCPAC, Training Systems
	Computerized front-end analysis tools	Service School Command, NTC, Great Lakes
Joint Staff Officer Training System	Training on joint staff operations	Joint Chiefs of Staff, Pentagon
AI in Explosive Ordnance Disposal	Computerized job aids	Explosive Ordnance Demolition Technology Center, Indian Head, MD
Courseware Portability	Programming standards for computer-based instruction /video	Office of the Secretary of Defense (OSD), Pentagon

Organizational Systems

Computer-aided Monitor Training (CAMT)	Manpower department overview for new officers	HQMC
Guidelines for Transportable Education and Training (GTET)	Transportable lessons from Defense Systems Management College's (DSMC) Program Management Course and lessons learned in converting transportable course/lessonware	DSMC; Air Force Institute of Technology; Training and Doctrine Command, Ft. Monroe
Experimental Civilian Personnel Office (EXPO)	Evaluation of innovative civilian personnel practices with recommendations and guidelines for the Department of Defense (DoD) implementation	Headquarters U.S. Army Communication and Electronics Command, Ft. Monmouth; Naval Supply Center, Norfolk; U.S. Air Force Academy Academy; Defense Industrial Supply Center, Philadelphia; U.S. Army, Heidelberg, Stuttgart, Frankfurt; Defense Memphis; Defense Depot, Contracting Administration Services Region (DCASR), Cleveland, Dallas, Boston, New York, Los Angeles, Chicago, St. Louis, Philadelphia; Air Base, Semipach; AFB, Patrick, Davis-Monthan, Minot, Andrews, Hickam, F.E. Warren; Defense Personnel Support Center, Defense Electronics Support Center; Defense Construction Support Center, Ft. Gordon. Ft. Eustis; Naval Training Center, San Diego; Naval Air Station, San Diego, Alameda, New London, Rota, Spain

Organizational Systems (Continued)

Project	Implemented Product	Site
Demonstration Project	Evaluation of 5-year Demonstration Project	Defense Depot, Ogden, UT (DDOU); Defense Logistics Agency Control Site
Organizational Survey	Develop and administer survey	Navy Regional Contracting Center (NRCC), San Diego NAVAIR-04
NAVAIR Total Quality Leadership (TQL)	TQL prototype	DCASR, Philadelphia
Defense Contract Administration Services Region (DCASR) TQL	TQL prototype	DCA
TQL for OSD	TQL prototype	Naval Aviation Depot (NADEP), North Island; Sacramento Army Depot
Defense Communication Agency (DCA) TQL	TQL prototype	Pearl Harbor and Portsmouth Naval Shipyards; NADEP, North Island, Cherry Point; Naval Supply Center, San Diego, Sacramento Army Depot
Navy Logistics Productivity Quality Improvement	TQL assessment	Fleet Combat Direction Systems Support Activity, San Diego; Naval Supply Centers, Oakland and Pensacola; NADEPs, Cherry Point, North Island, Jacksonville, and Norfolk;
Productivity Gain Sharing (PGS)	Gain Sharing System	Jacksonville, and Norfolk;

Organizational Systems (Continued)

Project	Implemented Product	Site
Productivity Gain Sharing (PGS)	Gain Sharing System	Naval Shipyards, Portsmouth and Charleston; Navy Regional Data Automation Center, Norfolk; Public Works Center, San Diego
Acquisition Technology	Technology Enhancements in Program Management Offices	NAVAIR (PMA-273, PMA-260)

Appendix B

Databases

Appendix B: Databases

Manpower	Database	Description	Sponsor/User
Defense Planning Programming Category (DPPC) Models	DPPC models forecast manpower based on historical workload data	PERS-5G	
Manpower, Personnel, and Training (MPT) Assessment Subsystem	Requirements and authorization by DPPC sponsor, program element, claimant, skill, and pay grade	PERS-5G	
Manpower Projection (MAPRO)	Ships, aircraft, and manpower (historical)	PERS-5G	
Force Analysis Simulation Technique (FAST) Input Model (FAIM)	Historical enlisted Navy personnel data	PERS-22	
Enlisted Management Community Data Base	Historical enlisted Navy personnel data	PERS-22	
Enlisted Personnel Planning System (EPPS)	Historical and projected Navy enlisted personnel data	PERS-22	
FAIM-O	Historical longitudinal Navy officer personnel data	PERS-21	
Officer Personnel Information System (OPIS)	Historical, aggregated Navy officer personnel data	PERS-21	
U.S. Marine Corps (USMC) Enlisted Personnel Data Base	Historical, longitudinal USMC enlisted personnel data	MPP-20	
USMC Officer Personnel Data Base	Historical, longitudinal USMC officer personnel data	MPP-30	
Qualified Military Available (QMA) Data Base	Qualified military available projections for USMC recruiting regions	Headquarters Marine Corps (HQMC) (M&RA)	

Manpower (Continued)

Database	Description	Sponsor/User
Recruiting Market Analysis Data Base	Historical demographic, economic, educational, production data by Navy recruiting areas, districts, and counties	PERS-23, Chief of Naval Recruiting Command
Defense Personnel Analysis System (DPAS)	All-service historical and projected officer and enlisted personnel data	Office, Assistant Secretary of Defense (FM&P)
Budget Obligation Analysis and Tracking System (BOATS)	Navy military personnel entitlements data	PERS-7
Personnel		
Naval Reserve Officer Training Corps (NROTC)	Applicant information, school performance information, fitness report (FITREP) data	Chief of Naval Education and Training (CNET), (N-1A)
Naval Academy	Applicant information, school performance information, FITREP data	U.S. Naval Academy (Dean of Admissions)
Officer Career	Questionnaire information, officer master file information	PERS-2
Navy Integrated and Training System	Navy class "A" school information merged with Armed Services Vocational Aptitude Battery (ASVAB) data and used for ASVAB validation and related studies and analyses	PERS-23C2, PERS-29

Personnel (Continued)

Database	Description	Sponsor/User
Computer Managed Instruction (CMI) Data ^a	Similar to Navy integrated training and reporting system (NITRAS) data, merged with ASVAB data and used for ASVAB validation and related studies and analyses	PERS-23C2, PERS-29
Joint Officer Monitor Officer (JOMO)	Officer and billet data pertaining to , 1st and present joint duty assignments for USMC officers	HQMC (M & RA), MMOA-3
Testing Systems		
Classification and Assignment Within PRIDE (CLASP)	Accession data, job options presented by CLASP	PERS-29
Personalized Recruiting for Immediate and Delayed Enlistment (PRIDE) Data ^b	Recruitment information (data of enlistment, targeted rating` from automated classification system (CLASP) used for studies on Navy recruits and creating regression formulas used in CLASP	PERS-23C2, PERS-29
Defense Manpower Data Center (DMDC) ASVAB Data ^b	Navy applicants and accessions by FY used for validation and related studies and analyses	PERS-23C2, PERS-29
American Youth Population (AYP) Data	1980 metric sample for ASVAB (youth 18-23) maintained, used for calibrating new forms of ASVAB, developing population parameters needed for correcting for restriction of range in ASVAB validation samples	PERS-23C2, PERS-29

^aData bases are extracted from larger data bases for use in responding to consumers's requests for data analysis.

^bData bases are extracted from larger data bases for use in responding to consumers's requests for data analysis.

Testing (Continued)

Database	Description	Sponsor/User
Reading Grade Level	Examinee data on both ASVAB and reading grade tests, used to estimate reading ability of military accessions without administering a reading test	Assistant Secretary of Defense (Force Management and Personnel) PERS-23
Adaptability Screening Profile (ASP)	Biographical, demographic, and 36-month attrition information on military service applicants and accessions	PERS-11EE

Education and Training

Operations Specialist (OS) Career Systems Design Rating	Materials, information, and products resulting from the OS rating training continuum	PERS-11EE
Electronic Warfare (EW) Career Systems Design Rating	Materials, information, and products resulting from the EW rating training continuum	PERS-11EE
Enlisted Training Tracking File (TRAINTRACK)	Historical longitudinal Navy training and personnel data--an SSN-based data file	PERS-11, Chief of Naval Technical Training

Organizational Systems

Database	Description	Sponsor/User
Total Quality Leadership (TQL)-Productivity Gain Sharing (PGS)	Maintain data on status of implementation of TQL and PGS for Navy organizations with 50 or more civilian employees	Secretary of the Navy (SECNAV)
Organizational Systems	Maintain data on organizational culture, climate, and effects of implementing TQM and PGS for those organizations participating in follow-up evaluations of TQM and PGS	SECNAV